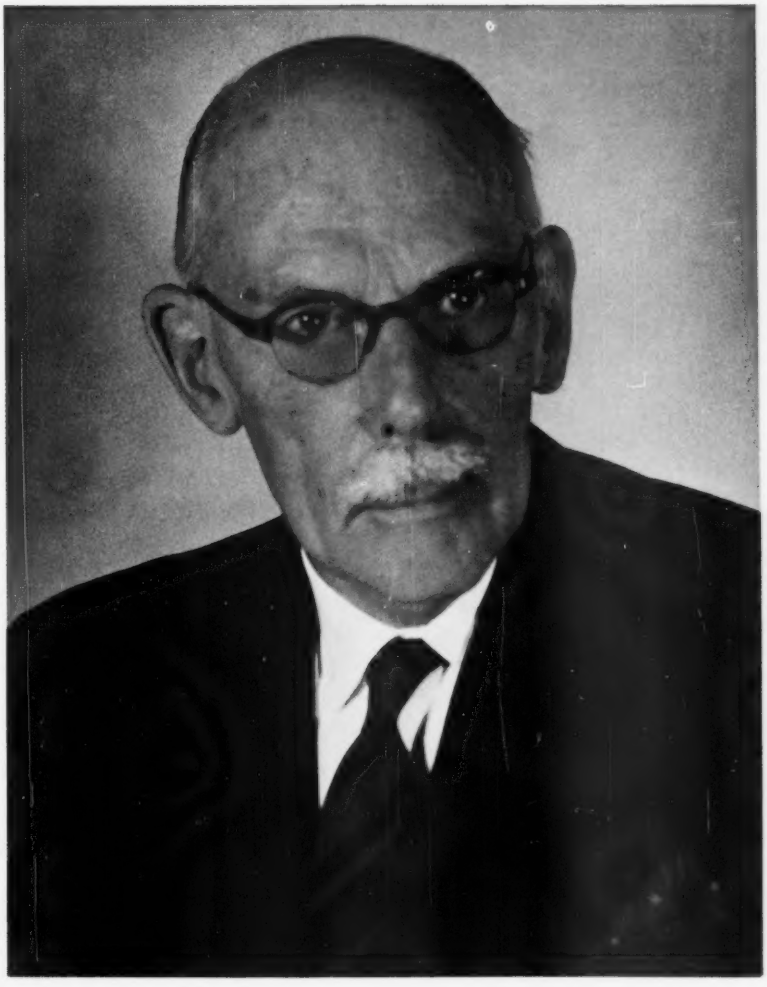
Consulting Engineer



February 1961

JAMES MAIN LINTON BOGLE was studying engineering at the University of Liverpool, England, when, some fifty years ago, a number of engineers in private practice began the formation of the Association of Consulting Engineers of Great Britain. They drew up four membership requirements that have remained unchanged: possession of the necessary technical qualifications; maintenance of their own office and staff; strict compliance with a Code of Professional Conduct; and avoidance of direct or indirect interest in commercial or manufacturing business allied to their work.

Continued on page 13

KOOL KOIL

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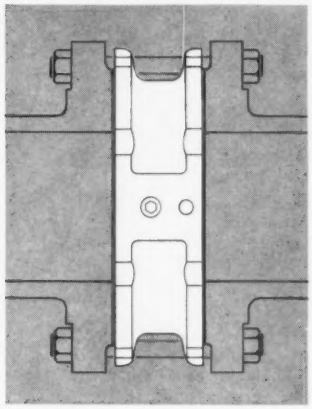
The Duo-Chek® is easily lowered into position between the flange faces; because of its light weight, special handling equipment is unnecessary. Fits standard valve flanges. In sizes 2 inch through 12 inch, one valve fits series 125, series 150 and series 300 flanges, saving inventory at less cost than a conventional 150 series. The machined outside diameter centers the Duo-Chek between series 300 flanges; the slots center it for series 150 flanges.



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For Engineers in Private Practice

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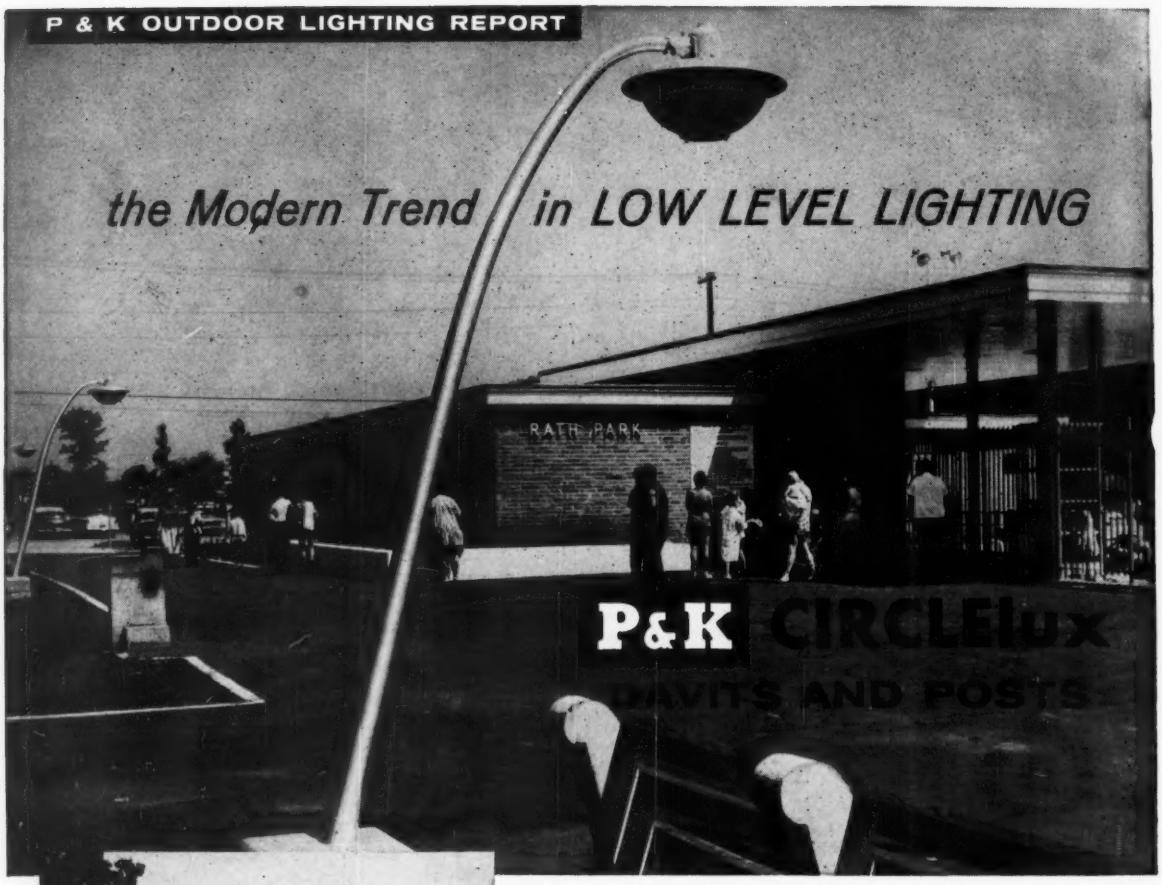
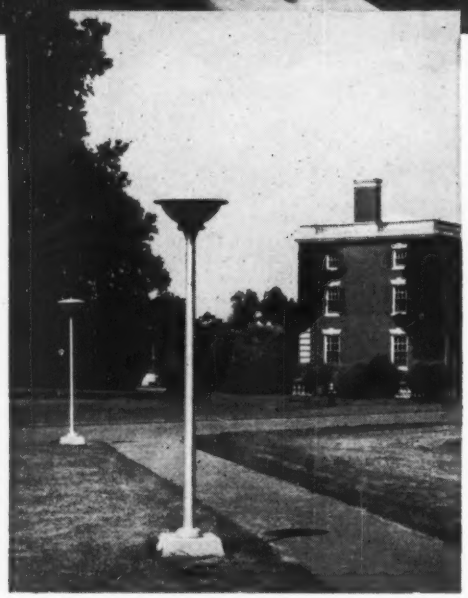
P & K OUTDOOR LIGHTING REPORT

the Modern Trend in LOW LEVEL LIGHTING





TOP PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y.
Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer

LOWER PHOTO: Location: Fairleigh Dickinson University, Madison, N. J.
Electrical Consultant: H. L. Sykes

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations – one an all new municipal swimming pool and recreational area – the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources – incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

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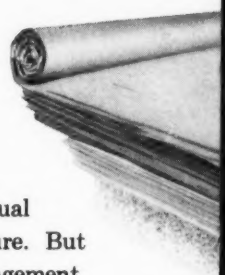
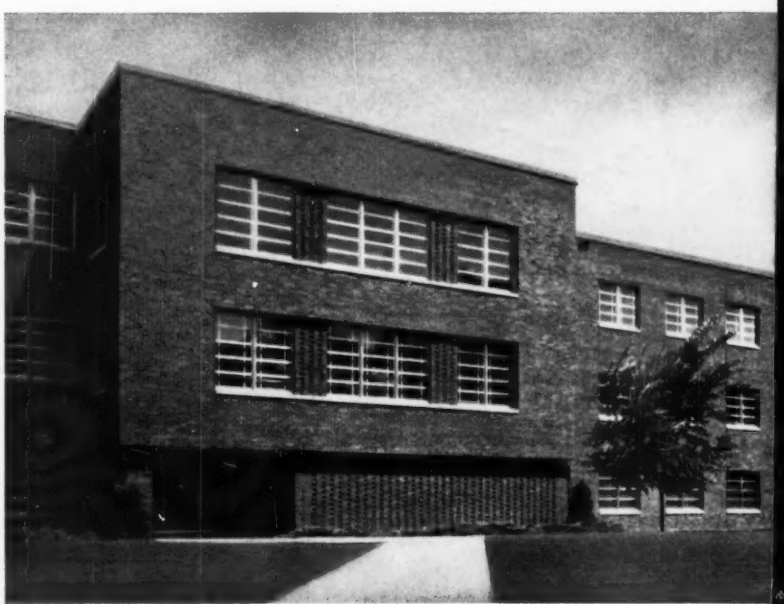
How *Imaginative Engineering* Uses Pneumatic Temperature Control To Guarantee Year 'Round Patient Comfort

Scott & Kinney, Kansas City consulting engineers, took a new look at an old problem and designed a *different* heating and air conditioning system for the University of Kansas Psychiatry Building. Their unusual method features two separate fan systems and a unique automatic damper application that eliminates the noise and distribution problems usually encountered with ordinary single-fan systems.



Providing uniform year 'round temperature together with foolproof individual room control has always been a problem in designing buildings of this nature. But Scott & Kinney provided the solution in their selection and imaginative arrangement of a Powers Pneumatic Control System.



Building "G", University of Kansas Medical Center

ARCHITECTS:
Kansas State Architectural Dept., Topeka, Kansas

CONSULTING ENGINEERS:
Scott & Kinney, Kansas City, Missouri

MECHANICAL CONTRACTOR:
A. D. Jacobson Plumbing & Heating, Inc., Kansas City, Missouri

Final check on the U. of K. Psychiatry Building's pneumatic control system by the consulting engineers, Wilson O. Kinney (left) and Arthur R. Scott.

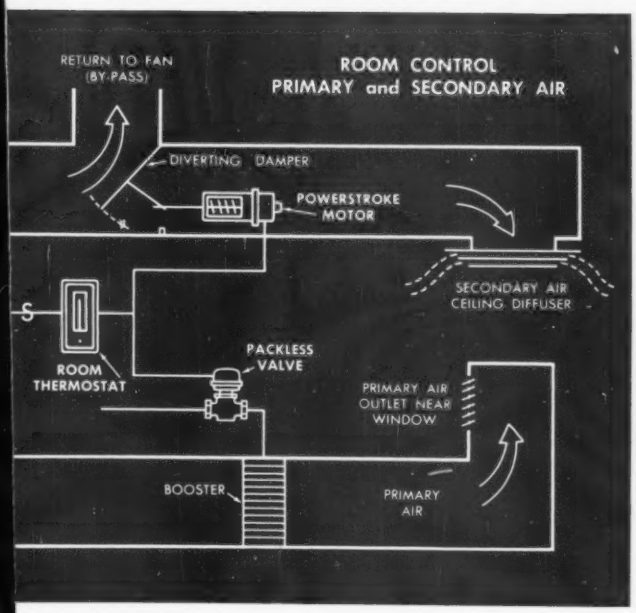
Heating, ventilating and air conditioning are accomplished through primary and secondary air systems. The primary system operates throughout the year, supplying a small amount of circulated air, including outside air. Final control in the primary system is a reheat coil — one for each patient room — using hot water with a Powers modulating packless valve.

Heart of the secondary — or booster — system is the automatic, quick-acting diverting damper. It permits both fresh and refrigerated air to pass into the individual rooms through a ceiling diffuser. When cooled air is not needed, it is diverted automatically by the damper into the ceiling plenum for return to the secondary fan.

To simplify individual room control of temperature, Scott & Kinney coordinated the actions of the reheat coil and the auto damper into a single control. One thermostat in each room controls both for maximum comfort.

This imaginative handling of standard Powers temperature control equipment is another example of problem-solving by the consulting engineer and the specialized help of Powers field engineers. The University of Kansas has reaped the benefits for the last four years — in comfort, operating economy and low cost maintenance.

For more ideas and technical data on Powers pneumatic temperature control equipment and systems, write for the latest Powers Catalog.



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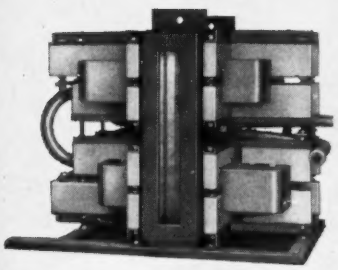
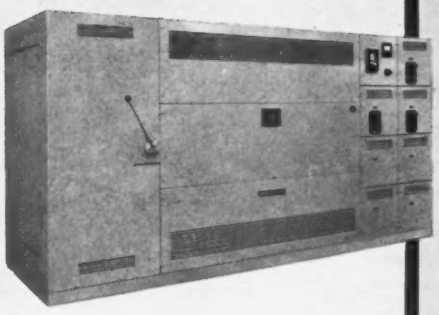


This electrical magnetic pump transformer, used with fluid lithium, is an example of Sorgel's engineering abilities to handle tough customer designs.



This 2,000 KVA, 3 phase, 13,200 volt, unit is typical of Sorgel load centers. These units are procurable with any type or make of switch gear.

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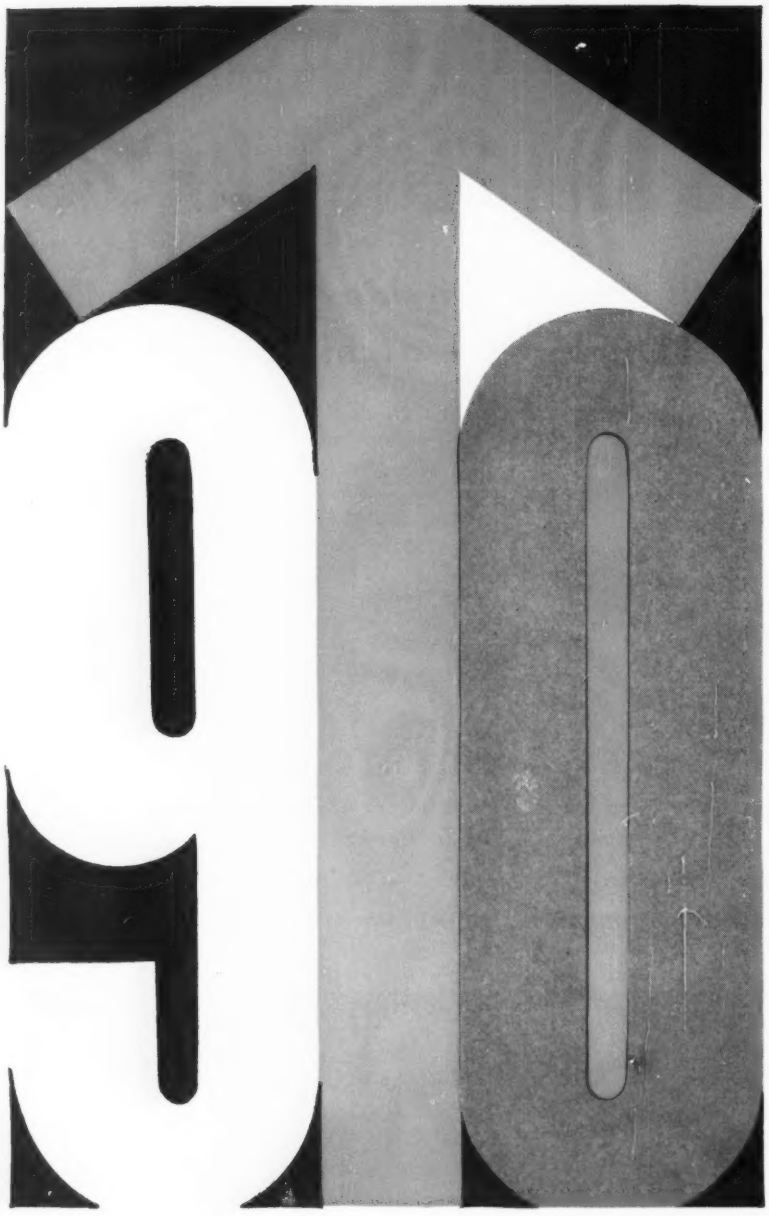

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INDUSTRIAL DIVISION

J. M. Linton Bogle

– Starts on front cover

One year ago, Linton Bogle completed his term of office as chairman of the Association, having steered his charge into an important decision – one that is significant of a new, and to some extent alarming, era for Britain's consulting engineers. The decision, in effect, was to double the Association's income from membership subscriptions and increments in order that it might meet the growing challenge of national and international competition both at home and around the world.

With the extra money, the Association has extended its offices and staff, and has embarked on a public relations campaign. Though the money available for public relations is hardly adequate for a high powered attack on the profession's competitors, the move is an acknowledgement of a need. The acceptance of public relations by a body of British professional men does not come easily, so it may be regarded as no small victory for Bogle and his Council that his fellow members have recognized and accepted the need for public relations.

Why Public Relations?

The reasons why the British consultant now feels in need of publicity will not appear strange to the U. S. consultant. The British consultant is beset with increasing competition from government engineering departments and free engineering design offers by contractors and manufacturers. For example, Chairman Bogle was compelled to report, at the end of his year of office, that one government department "had given certain large sections of work to some member firms but the full resources of the Association have not been called upon, nor employed." Again, he noted that requests for consulting engineering advice from another nationalized industry "appear to have ceased."

The Association has engaged a public relations firm with the prime objective of telling the public just what a consulting engineer is and what he does. Considering that the Association of Consulting Engineers in Britain is nearing a half-century of existence, and considering Britain's great engineering history and the longevity of her several engineering institutions, a campaign to tell the public what a consulting engineer is and what he does is, to say the least, timely.

Deceptive Surroundings

The offices of Lemon & Blizard, of which Bogle has been the senior partner for the last five years, are located in an area designated a "precinct of Westminster Abbey." There is an air of romance surrounding these buildings that run from Tufton Street the short distance down to the River Thames. As Bogle looks out his window he can see the four corner towers of the war-damaged St. John the Evangelist, a church that has been known for very many years as "Queen Anne's footstool." The architect of this church was commanded to produce his plans for her Majesty's approval. The Queen was disgusted at his design and petulantly kicked over her footstool, exclaiming, "You would do better to build something like that!" And so he did!

This kind of environment often deceives the visitor from overseas who assumes that such a charming old part of London stands as material evidence of the charming old British businessmen who work in it. Linton Bogle is by no means the type that is implied by those who use the expression. Now 70 years of age, Bogle is enthusiastic in support of his ideas, and quick to pick up any illogical ingredients when they are tossed into a discussion.

Personal Background

Born in South Africa, Bogle was educated at Epsom College and Liverpool University, and served with distinction in the Royal Engineers during two world wars, earning the Military Cross and the Territorial Decoration. He worked for 10 years in India before joining his present firm.

After graduation from college, Bogle became a member of the City Engineer's Department in Liverpool, England. The City Engineer at that time, John Brodie, was working with Sir Edward Lutyens and Major Swinton in planning India's capital city, New Delhi, and Bogle worked on some of the plans. It is said that it is still possible to detect three distinct approaches to the planning and construction of New Delhi, each characteristic of the three experts concerned. Bogle's story goes like this: When the three-man commission found they had to survey many square miles of desert country with no roads, difficulties arose over the mode of transportation to be used. Lutyens decided to ride a horse; Swinton, because he did not ride a horse, chose a camel; and Brodie, who weighed about 250 pounds, elected to travel by elephant. The natural antipathy of the three animals to each other, and the different levels at which plans had to be held, compelled the planners to divide up their work and carry on in separate areas. Thus, says Bogle, you can tell today whether you are in the horse-mounted, the camel-borne, or the elephant-carried section of New Delhi – provided, of course, you are familiar with such modes of transportation.

British Engineers Need Overseas Experience

Bogle considers his overseas experience practically invaluable, and he will advise any young British engineer to seek experience and responsibility over-

seas, where conditions are varied. Happily or unhappily, as you care to view it, Britain does not enjoy the many differing geographic and climatic conditions within its borders that may be found in the United States. In consequence, says Bogle, the U. S. engineer may find within his own country those varying engineering conditions and responsibilities that the British engineer must seek overseas. In Britain, there is a much slower pace of climbing the ladder, and if the young engineer wants greater experience and responsibility, he will be wise to find overseas work as soon as practically possible.

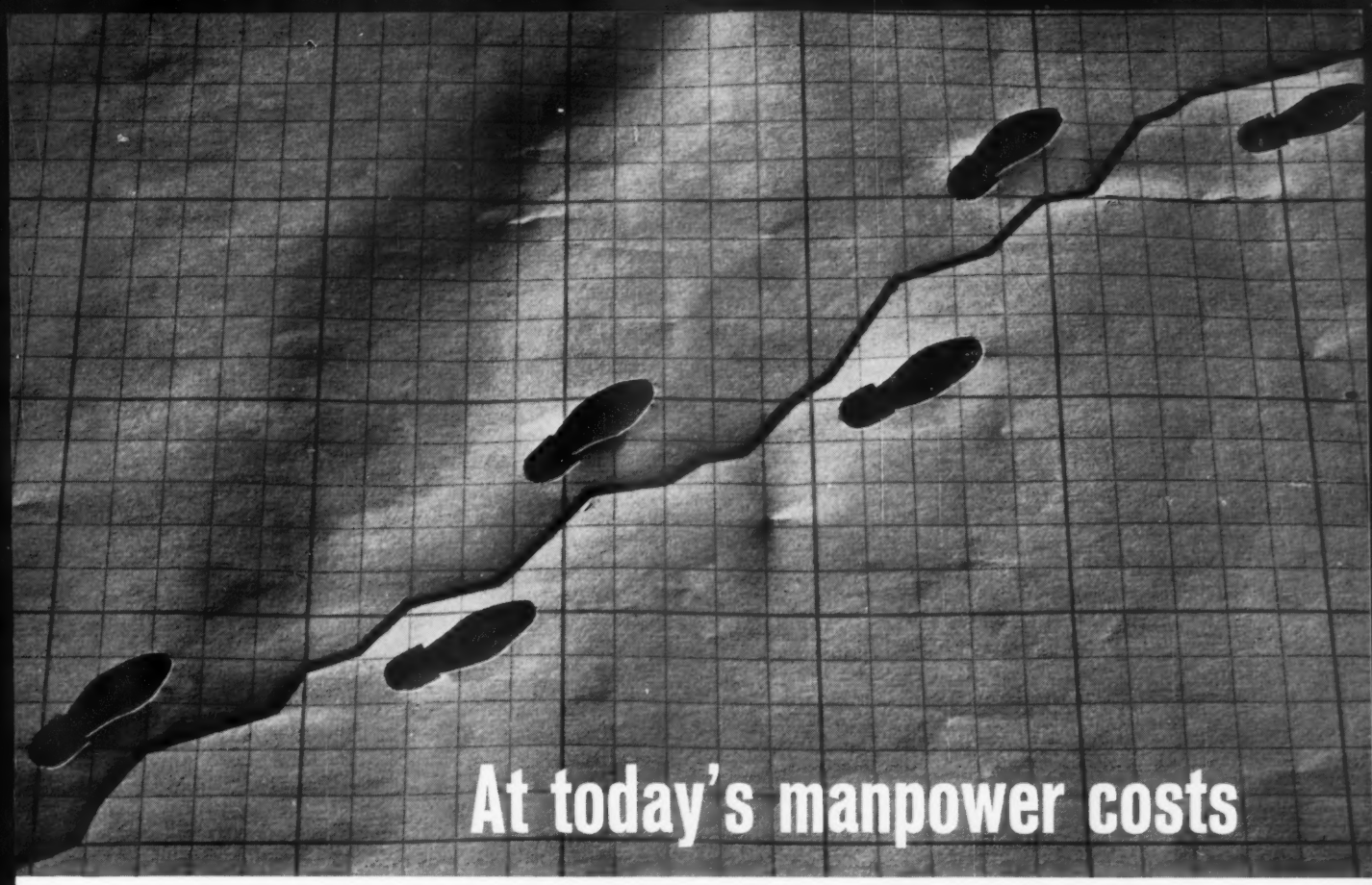
In the past, the young engineer could go to some overseas territory under the aegis of the British Crown, and get good engineering experience. Nowadays, newly independent or self-governing countries employ more of their own nationals and hire overseas engineers only for big development schemes. The chance for the young engineer to go overseas is more often with the large firm of consulting engineers employed on such work as thermal power stations, hydroelectric plants, irrigation schemes, and similar projects of major significance.

The British government is continually pressing the consulting engineer to obtain more large works abroad, as a necessity for the country's economic well being. "But," grumbles Bogle, "if firms are to be in a position to do this, they must be employed at home on the type of works that nationalized industries, regional boards, and local authorities, have to carry out, so that they may have the necessary experience with which to obtain similar jobs overseas. Foreign clients will not be ready to employ consultants on specific jobs unless the consultants can show that they have considerable experience in this type of work. The British consultant must now take his experience with him when he goes abroad, not go abroad to seek it – at least not as a firm seeking a specific job." The solution to this endless-belt problem, remains to be found, but Bogle thinks public education through a public relations campaign is one way of tackling it. And he is doing all that he possibly can to get it underway.

Lemon & Blizard

Since its inception, Lemon & Blizard has been concerned chiefly with the design of water supply works and main drainage. This means clients are generally local governments or local government agencies, and much of the firm's work has been performed in the English counties of Devon and Cornwall. Here, the moorlands that provided Daphne du Maurier the setting for her novels, also provide sources of water at a high enough level for distribution by gravity over a wide area.

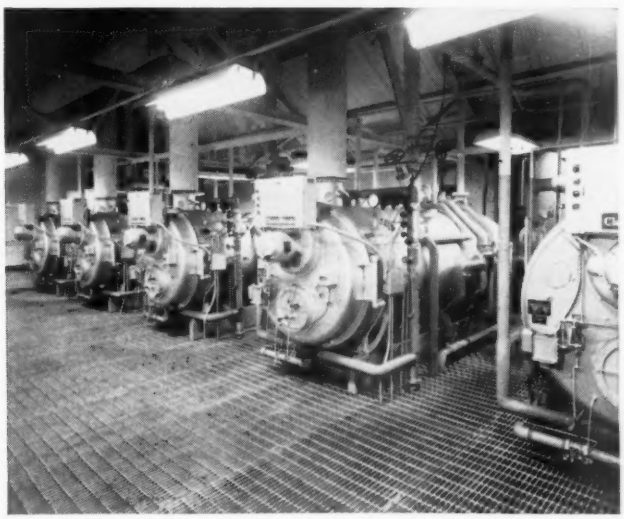
During the time that Bogle was in charge of his firm's Plymouth office, L & B designed the works of



can you afford to recommend a boiler designed 20 years ago?

$15,000-A-YEAR LABOR SAVINGS

Diebold, Inc., Canton, Ohio, century-old manufacturer of bank protection and office equipment, replaced old, coal-fired boilers with new, fully automatic, gas-fired CB boilers and saved $15,000 to $18,000 in annual manpower cost. *All five of these new boilers are operated by just one man* — other personnel have been transferred to more productive work assignments. Bill Roby, assistant plant engineer, speaks highly of the ease of installation and the compact design.



New or old, there's one thing about any boiler that's up-to-date: your clients have to pay today's wages for the men who tend it. This becomes out-of-line overhead if they're operating a boiler designed in the days when man-hours were far less costly.

As wages have doubled during the past two decades, one manufacturer, Cleaver-Brooks, has pioneered in making a boiler that requires fewer man-hours to operate. Today's CB packaged boilers provide a combination of labor-saving design features and performance standards that cannot be found in any other boiler — at any price.

Hinged doors, front and rear, provide for quick cleaning of the tubes. It takes only 40 seconds to remove and replace the retractable burner nozzle. Fully automatic, these boilers include electronic safety devices which release the operator for other duties. And, because some jobs require quick changeover from one fuel to another, Cleaver-Brooks boilers are designed to make this change in less than a minute.

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three Country Water Boards, using the moorland sources, and it was in this southwestern corner of rural England that Bogle chalked up one of his most satisfying engineering achievements. This was the construction of the Avon Dam. Two years ago, in New York, he delivered a paper on one aspect of the Avon Dam to the Sixth Congress on Large Dams. He explained the provision for the future raising of the dam by using stressed cables. At the time of construction, vertical holes of the correct size to take post-stressed cables for a future raising by the Coyne method were located in the structure. In this way, with a negligible initial cost, the dam may be raised in the future at about half the cost which would normally be anticipated.

Engineering Education

Bogle believes strongly that an adherence to the wider view of education for young engineers is also most rewarding. "In this year, when the government is discussing the possibility of a 75 percent increase in the number of technically qualified men by the early 1970s, and when, for the first time in 700 years, Cambridge University has decided to admit students who have not passed a preliminary examination in Latin, the need to prevent technical education becoming too specialized is urgent." One way of ensuring this is by helping as many as possible to obtain a university education, and Bogle, in his work as a member of the Board of Civil Engineering Scholarship Trust, helps to allocate the considerable number of scholarships given yearly by the body. He thinks it should be compulsory for the young engineer to tackle at least one nontechnical subject, such as the history of engineering, a modern language, geology, or physical geography. Any of these would aid the "rounding-off process" and so help to give him a broader outlook – an attribute which engineers are going to find almost mandatory in the future.

A Man on the Go

Today, Linton Bogle likes to spend a little less time at the drawing board and more time in the rose garden of his Cambridge home. But he is no where near retiring from engineering – or from the world. That was most effectively demonstrated as we interrupted the interview to go to lunch at Bogle's club. Walking rapidly along Victoria Street toward the pedestrian crossing in front of the Houses of Parliament, he rapped out, "Look as if you are a Member of Parliament, and the policeman will hold up traffic for you." He darted out between a bus and taxi, and took the rest of the street crossing in style, protected by the outstretched arm of the law. This service by the obviously impressed policeman was acknowledged gracefully by a salute with Bogle's ever-present rolled umbrella. ▲▲

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New *SpaceMaker* control is the first completely new high-voltage motor controller in more than a decade. It is the first two-high, 2 to 5 kv control center, and the first in its voltage class with complete drawout construction for unprecedented safety and accessibility.

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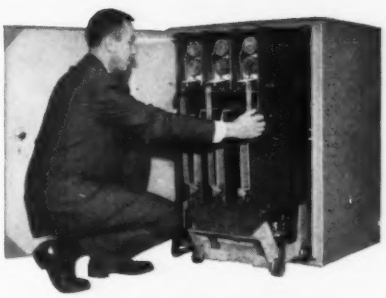
For complete details of the new, years-ahead SpaceMaker *controller, call your nearby A-C representative. Or write* **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wisconsin.* A-1406



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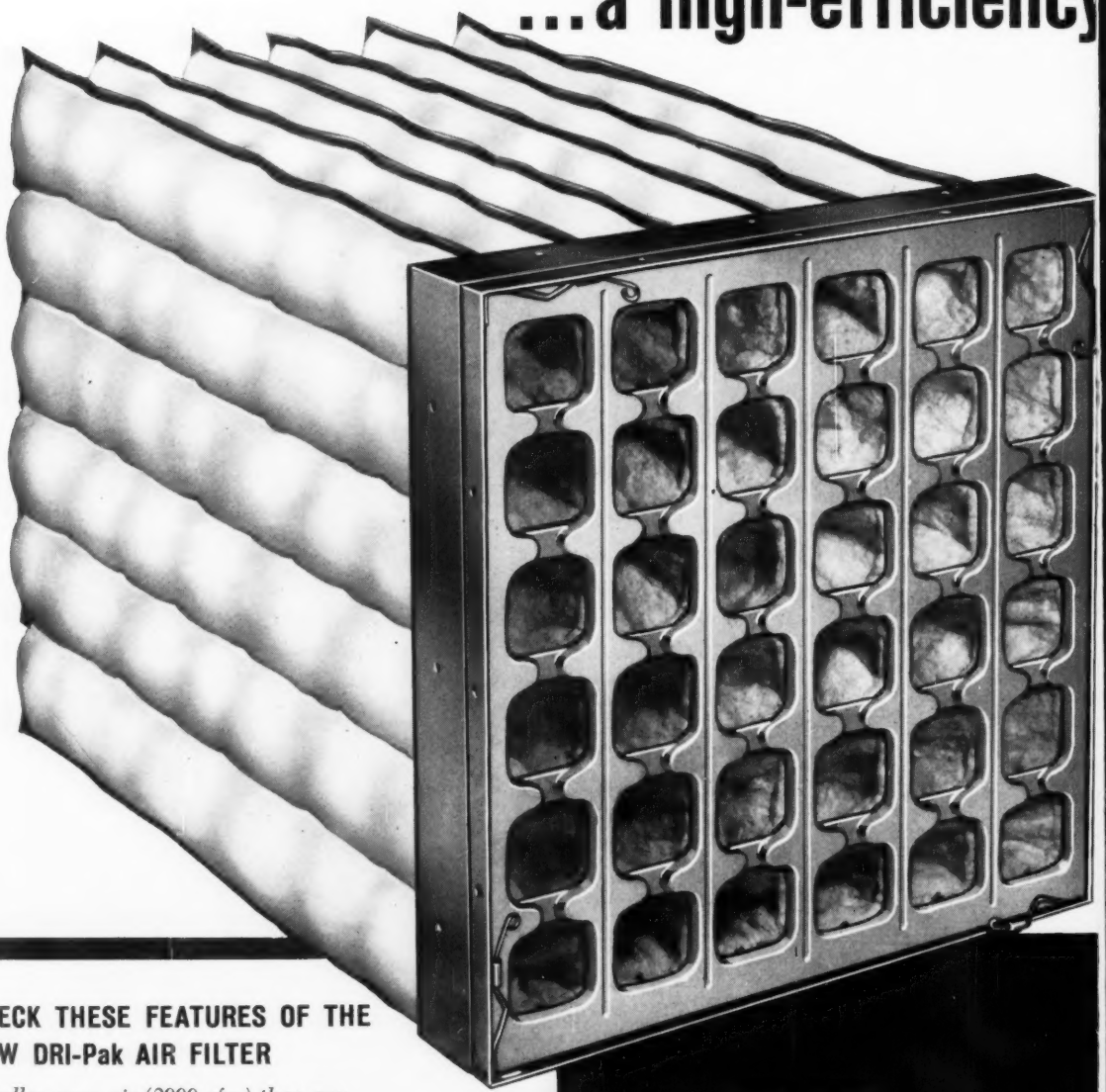
NEW! DRI-*Pak* SERIES 2000

...a high-efficiency



CHECK THESE FEATURES OF THE NEW DRI-Pak AIR FILTER

- *Handles more air (2000 cfm) than any similar unit!*
- *Unique holding frame (only 4" deep) permits servicing from either air-entering or air-leaving side of bank.*
- *Rated at 95% efficiency! (National Bureau of Standards Dust Spot or AFI Method on Atmospheric Dust.) Models rated at 85% and 55% also available.*
- *Compact, collapsible cartridge weighs just 4 pounds, requires little storage space, makes handling and servicing simple and easy.*

95 sq. ft. of filtering media in one unit!.....

nit filter from AAF!

New dry-type unit offers unmatched combination of air filter advantages. AAF's new DRI-Pak Series 2000 air filter combines high efficiency, low resistance, compactness and large dust-holding capacity to a degree unequalled by any other dry-type unit filter.

The secret is in its unique "windsock" operation. The "tubes" of the glass fiber media inflate to a 36-inch depth when the system is in operation, but collapse when the system is shut down! This collapsing feature eliminates the need for rigid back-up wire grid and the possibility of damage to the cartridge during servicing.

Filter maintenance amounts to nothing more than infrequent replacement of the DRI-Pak cartridge. And the plenum for a bank of DRI-Pak filters need be very little deeper than the filter's 36-inch inflated depth because almost the total space can be used as access to washer, coils, etc., when the system is shut down. The AAF DRI-Pak is available is 24" x 24" or 12" x 24" sizes.

For complete product information on the new DRI-Pak air filter, call your local AAF representative or write us direct for Bulletin No. 228. Address: Mr. Robert Moore, American Air Filter Company, Inc., 300 Central Avenue, Louisville, Kentucky.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

inch-deep carton...holds two filters...each weighing just 4 lbs.!

Readers' Comment

No Trade Barrier

In the October 1960 issue of CONSULTING ENGINEER, you carried a brief item entitled "Interstate Trade Barrier?," in the "Heard Around Headquarters" section of your magazine. We have received a copy of the material on which your article was based, and can assure you that it was not an official communique from the Association, nor does it reflect our thinking, policies, or procedures.

In the constitution and bylaws of the New Jersey Association of Consulting Engineers, adopted September 16, 1958, there are five main objectives:

¶ To insure that ethical professional standards worthy of an independent consulting engineer are maintained.

¶ To advance the value of the consulting engineer to the public, and to educate the public regarding the services performed by the consulting engineer.

¶ To promote harmony, cooperation, and mutual understanding among independent consulting engineers engaged in private practice.

¶ To promote the professional and economic welfare of its members.

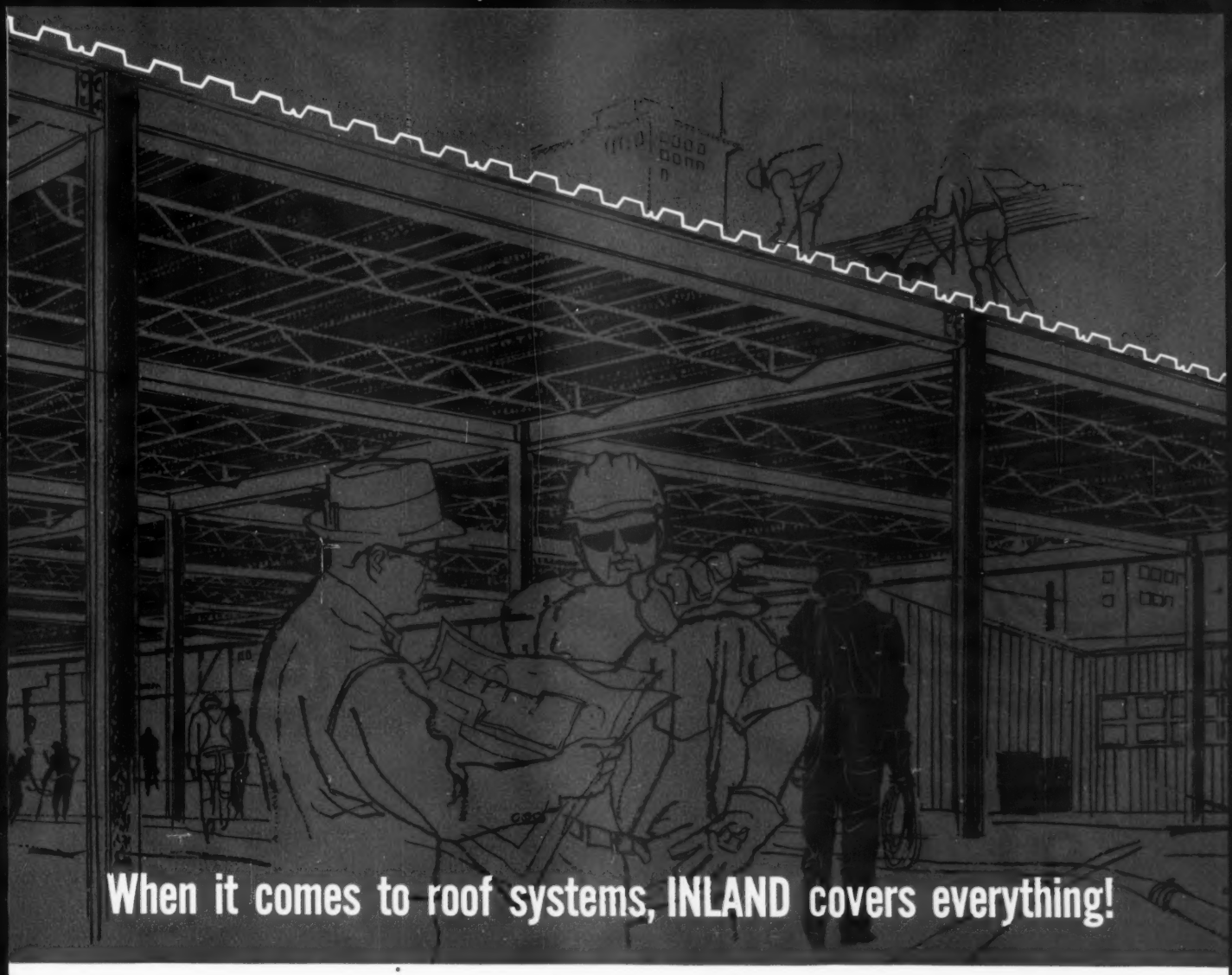
¶ To act as a clearing house and information center on all matters of mutual interest to its members.

Of course, we realize that these objectives can be loosely interpreted, but the only one that could lead to the type of criticism implied in your column is the fourth, which requires further explanation.

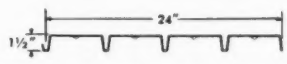
The State of New Jersey has more than 200 listed and qualified consulting engineering firms, which is way out of proportion to the number of state highway, school, or public works projects that are required to keep them busy. Many of our firms could not exist without contracts received from other states or foreign governments. Nonetheless, we would be failing our membership if the bulk of the state work were being performed by out-of-state firms without regard for the local talent. This, however, is not the case.

Our interpretation of Point No. 4 is that where state projects are to be performed, state firms should receive consideration for the performance of such activities. I believe you will find that this is the philosophy of all state associations and their members, whether organized as such or not. This does not imply that we wish to exclude all others from the opportunity of working for the state. We only desire consideration because of our professional accomplishments, our knowledge of state activities and problems, and because we are resident firms, helping to support state projects through taxes, employment, and business activities.

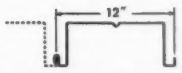
We wholeheartedly support the right of nonresident firms to make



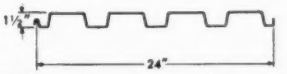
When it comes to roof systems, INLAND covers everything!



A-DECK — For purlin spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest type of insulation.

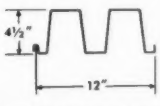


H-DECK — New! For simple spans from 10'0" to 20'0" — 3 and 4½" depths. Especially practical to cover walkways in shopping centers, schools, other installations.

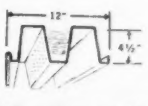


B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural efficiency — gives higher section properties per pound of steel — well suited for use as side wall panels.

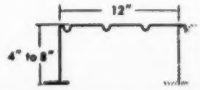
B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70 — used for spans to 10'0".



C-DECK—Carries normal roof loads over spans up to 24'0". Used extensively in canopies.



C-ACOUSTIDECK — Offers same Noise-Reduction Coefficient as B-Acoustideck. Can be used for spans to 24'0".



T-STEEL — New! Galvanized only — for clear spans to 32'0". Adaptable to acoustical and flush, luminous ceiling treatments. Provides superior diaphragm to transmit seismic and wind loads.

RIBFORM — High tensile galvanized steel form for concrete slabs over spans up to 8'0". Three types: Standard, Heavy-Duty, Super-Duty.

Whether your design calls for a dry insulation board roof or for wet-fill, there's an Inland roof system for the job — by the makers of famous Milcor steel building products.

Inland steel deck weighs less than half as much as poured-in-place or pre-cast construction. You can space joists wider and use lighter framework, to save both time and money. Panels are easy to handle and weld in place — in any weather that a man can work.

Types A, B, C, and H decks have the additional advantage of a Bonderized, baked-enamel prime finish that resists on-the-job damage. One field coat of paint on these Inland decks usually covers.

Write for catalogs 240, 241, and 245 — or see Sweet's sections 2c/Inl, 11a/In, and 2a/In.

member of the INLAND steel family

ENGINEERED PRODUCTS DIVISION

INLAND STEEL PRODUCTS COMPANY

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their specialties and talents known to our state officials, because our member firms with unusual talents and specializations are actively seeking contracts beyond our own state boundaries. This is the heart of the American free enterprise system and a point that we would be remiss in not recognizing.

John G. Reutter
President
New Jersey Association
of Consulting Engineers

Fan Mail

Your excellent publication CONSULTING ENGINEER stimulates some of my more successful associates. Occasionally, an issue is loaned to me.

Your September 1960 summary of sewage treatment was brought to my attention today. I should have been aware of this unusually comprehensive condensation of an entire fields months ago . . . Even your ads cover interesting allied equipment not usually included in the more specialized sanitary engineering publications.

A. W. West
Chief Sanitary Engineer
Holmes & Narver, Inc.
Los Angeles, California

BRI Wants Consultants

In the "Field Notes" section of the January issue of CONSULTING ENGINEER, you commented on the shortage of consulting engineers at the recent Building Research Institute convention.

The reason we had so few consulting engineers on the program is that so few of them are BRI members. There is no way we can force them to join and thus participate in the formation of BRI programs. Your article implies that BRI is somehow to blame for the lack of engineers on the program. This is definitely not the case. When more engineers join BRI and participate on committees, their voice will be heard.

This is a membership organization with a member-directed program.

STEPHENS-ADAMSON PULLEYS

CURVE CROWN® BY STEPHENS-ADAMSON

FEATURING "SQUEEZELOCK" HUB DESIGN

FOR GREATER BELT TRAINING EFFECT... REDUCED BELT WEAR

STURDY RIM CONSTRUCTION

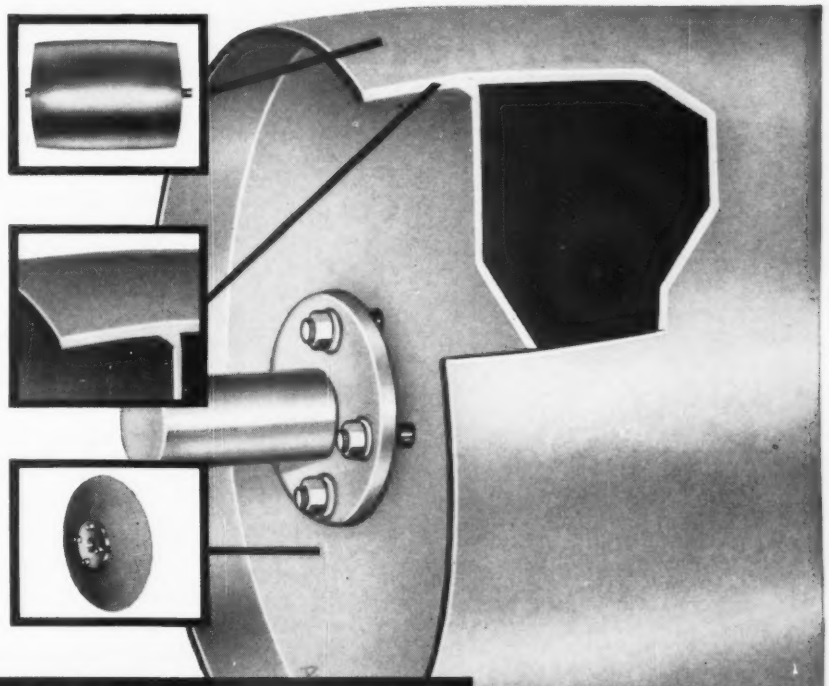
Pulley rims are made of one-piece construction, formed absolutely round under hydrostatic pressure. The only seam is machine-welded both inside and out to insure 100% penetration of welds.

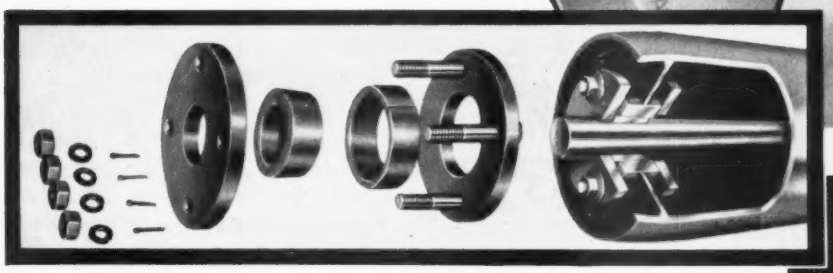
CURVE CROWN® DESIGN

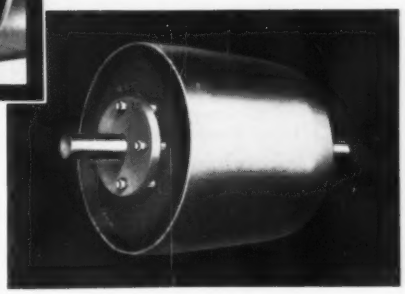
Curve Crown on outer ends of rim accurately formed. Revolutionary design eliminates conventional center peak — high point for belt stretch and wear —while increasing belt training effect more than 100%.

ACCURATE END PLATE ASSEMBLY

End plates are machined on both the O.D. and I.D. to insure concentricity between the bore and the outer rim. They are pressed into position for tight fit-up and submerged arc-welded for maximum efficiency.







"SQUEEZELOCK"® HUB Revolutionary design of "SQUEEZELOCK" Hub provides gripping power for full torque transmission without the use of keyways and eliminates distorting loads against pulley end plates. Two split tapered bushings are wedged against shaft and pulley end plates by two independent hub plates which are squeezed together by tightening four large diameter bolts.

Write for Bulletin 558

S-A

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SPEEDWALK PASSENGER CONVEYORS
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BELLEVILLE, ONTARIO

We have found that consulting engineers generally are very busy and very much involved in the affairs of their professional societies, and have not yet seen the need to find time to devote to interdisciplinary activities related to building. We do have a few notable engineering firms as members, and some are active on our committees. But about half the consulting engineers we ask to serve on our committees decline, due to the press of other business.

Irving Shapiro
Assistant to Manager
Information Services
Building Research Institute

Committee on Engineering Law

Your article on "The Committee on Engineering Laws" (December 1960) was quite, but not entirely, revealing. It named some of the member firms and two of the Committee's spokesmen. It also showed something of the philosophy, the finances, and methods of operation of the Committee. It did not show whether engineers are never spokesmen for the group for shame or because their masters do not allow them out in public.

William A White
Executive Director
California Council
Civil Engineers & Land Surveyors

Survey Complimented

I have read the staff report "Survey of the Profession" (January 1961) with a great deal of interest and want to compliment your group on the job. It is very interesting and impressive.

Frank Sanford
Commonwealth Associates, Inc.
Jackson, Michigan

As we pointed out in our January issue, the staff reports based on our reader surveys are as much the work of the readers as of the editors. In this issue we are publishing additional data from the 1960 survey, and, as time permits in the future, there will be more. ▲▲

Now...Time for the Boys

Electrical Problems No Longer Short Circuit Our Family Fun

Sure, a father should be a pal to his sons . . . and, mine are at the age when they need and appreciate my companionship most. But when you're lucky enough to be employed at an assembly plant that's doubled capacity twice in the past eight years, you've got more than a full time job . . . and family activities frequently have to take a back seat.

During these eight years I've come up through maintenance to Assistant Plant Manager. It started when I suggested we replace certain troublesome motors with silicone insulated units. Then, when we doubled our plant the first time, I suggested we could double our electrical load capacity in the same floor space by using silicone insulated transformers. Just before our last expansion, my boss was made Plant Manager and I moved up to his assistant. He's taught me a lot . . . and I think I've helped him. We're a good team. And, for the first time since I started working, I'm finding time to really enjoy my boys. By the way, the car we're restoring is a Model A. No, not a Ford . . . a Dusenberg.

I think my progress is the result of plenty of hard work and a good eye for new and better ways of doing things. One of the most important things I've ever read was an advertisement on Dow Corning silicone insulation for electrical transformers and motors—just as you're doing now. I wrote for more information. Why don't you?

For brochure, "Specify Silicone Insulation and Save", Write Dept. 2314.

first in silicones

Dow Corning CORPORATION
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This is the embodiment of a design philosophy . . . a blending of function with aesthetics...an imaginative application of appropriate materials and manufacturing processes to good lighting. The product is *Prismalux*, a handsomely proportioned fully luminous form which cuts glare, reduces brightness contrast to minimum. The optically engineered prismatic lens directs controlled illumination downward. Diffuser sides provide soft peripheral lighting on ceiling areas, adding visual comfort. Both lens and

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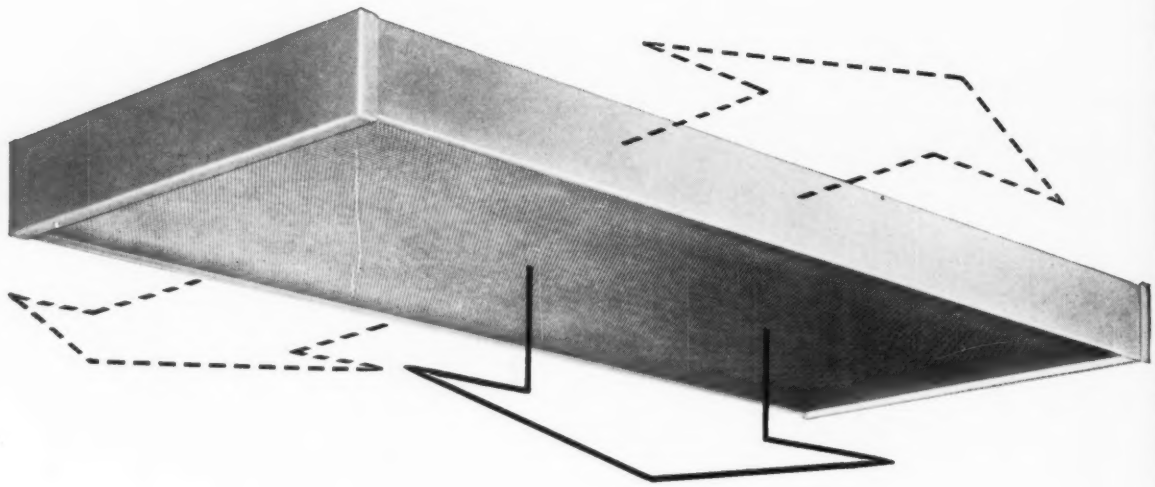

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sides are molded of styrene or Plexiglas into a single, sturdy unit for clean appearance, rapid installation, simple upkeep. Safety hinges along full length permit easy access from either side, prevent accidental dislodging. The result: a fluorescent fixture ideal for schools, offices, stores, or any application where crisp styling is desirable, efficiency is required, good lighting is essential. You may specify Prismalux either stem or surface mounted, in four or eight foot lengths, in two, three or four light widths.

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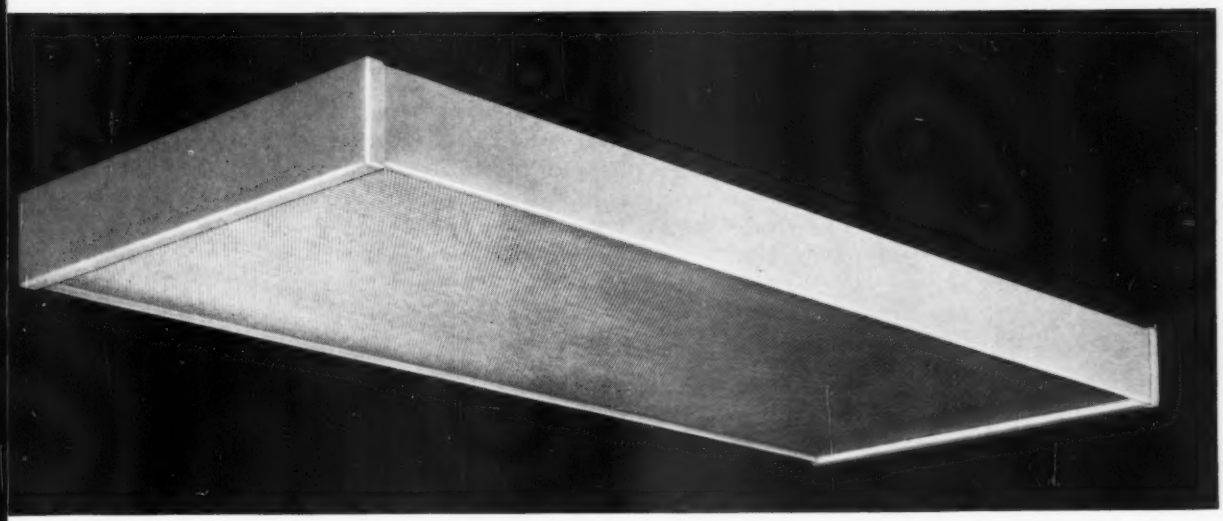

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From the Editor's

Tranquil Tower

The Professional "We"

WE HAD the opportunity not long ago to have some social conversation with a medical doctor on the subject of scientific progress in medicine. The doctor with whom we talked is a bright young man, a successful general practitioner in a small city, but the longer we talked, the clearer it became that as a member of the medical profession he separated people into two groups, (1) medical doctors, and (2) others.

He spoke of the antibiotics "we developed." He pointed out that "we have been doing research along that line for some time," and he described several operating techniques "we have begun to use."

There was nothing unnatural in his manner. He honestly felt, without any pomposity or affectation, that as a medical doctor he participated in all medical research and development activities. When he said "we did this," or "we did that," there was no doubt as to whom he meant. He meant the medical profession.

This professional camaraderie is common to all the learned professions, though it is much stronger in medicine than in law or theology. But it is strong enough in all three for one to assume with some confidence that it is an essential attitude of any true profession. Undeniably, lawyers find it pleasant to separate society into attorneys and laymen, and the church has always made it clear that there are many mysteries which, if not actually denied the laity, are theologically too obscure for general dissemination. If there is any doubt about this, attend a meeting of lawyers or a convention of clergy and learn just how very lay a layman can be.

Engineers do not have this intra-professional togetherness. Instead, Civils refer to Mechanicals as "they." Engineers in government look upon engineers in industry as outsiders. Men in engineering research never identify themselves with plant engineers. And if this separation into schisms is less serious among private practitioners, who tend to have a smattering of togetherness, even this is far short of true fraternity.

Outside private practice there is nothing resembling professional unity of spirit. Who ever heard a power company engineer describe his new car as having certain mechanical features "we developed"? And what government bureau engineer would claim professional participation in a new commercial development by describing it as a result of "our research"? Engineers have no deep feeling for in's and out's.

Whenever Westinghouse or General Electric comes up with an important new product, other engineers happily credit the company with the research, the development, and the accomplishment. But if Parke-Davis or Upjohn or any of the other ethical drug manufacturers comes up with a new drug, every doctor in the country takes credit. He will say, "We now have new ways to treat that trouble . . ."

The doctors are so consistent in their togetherness that there is little doubt they are properly and fully indoctrinated with the attitude when they are in medical school. It is as though they alone shared certain secrets, as did their witch doctor predecessors. Unfortunately, engineering schools do not attempt to instill in their undergraduates the true spirit of professional exclusiveness.

We seriously and strongly recommend that consulting engineers adopt this professional strategy. It will take time, but after a little practice, it should come naturally. The next time the conversation turns to rockets, simply admit that "we have been having a little trouble, but we are on the verge of some real results." When the subject at the cocktail party is the temperature of the room, point out that the air conditioning system is out of date – "we now have developed much better equipment and controls than we had just a few years back." On the subject of automobiles, you can state that "we had a lot of trouble with the stylists, but we finally got them back on the right track with the compact car."

It may seem awkward at first, but you will get used to it. We can never hope to take our place among the real professions until we can automatically and naturally separate people into two groups, (1) engineers, and (2) others. ▲▲

HERE'S HOW BORDEN FLOOR GRATING CUTS COSTLY FIELD CORRECTIONS . . .

Insures correct dimensions, fit, and placement . . .

1. A shop drawing of the job is submitted to the customer for approval, when necessary. This plan shows the size and shape of the grating area — how grating clears all obstructions.
2. Each finished panel is carefully checked for accuracy of dimensions.
3. Each panel is plainly marked with its number to insure quick, easy installation.
4. The entire platform is laid out on our shop floor. Overall dimensions and obstruction openings are checked against shop drawings.
5. Erection diagram showing panel mark numbers is supplied for field installation.

Write today for *free*
16-page catalog showing all basic types of grating;
more than 30 dimensional drawings of subtypes;
eight safe load tables for steel and aluminum grating.

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Gentlemen: Please send me NEW 1961 BORDEN Catalog

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LEE'S LECTURE

The Era of the Indefensible Status Quo

JOHN F. LEE
President
State University of New York

WE LIVE IN AN AGE when the work of ten years must be, and is, accomplished in one year. This is an era in which the status quo is indefensible and its defenders meet swift and ignominious defeat. It is an era demanding the intellectual capacity to understand, to evaluate, and to project. To appreciate the rapidity of change, consider some of the things that will be accomplished by the end of this decade.

¶ Our population will increase from 180 million to over 220 million — an increase roughly equal to the total population of Great Britain today. The number of households will increase from 50 million to 63 million. More than half the population increase will be comprised of people under 25 years of age, with 30 percent between the ages of 15 and 24. Last year our work force totalled 72 million; by 1970 it will be 87 million. The work week in 1970 will be reduced to 30 or 35 hours. Approximately $280 billion will be available as disposable discretionary income, and the gross national product will rise to $750 billion. Research expenditures will increase from the present level of $3 billion to $12 billion annually, averaged over the present decade.

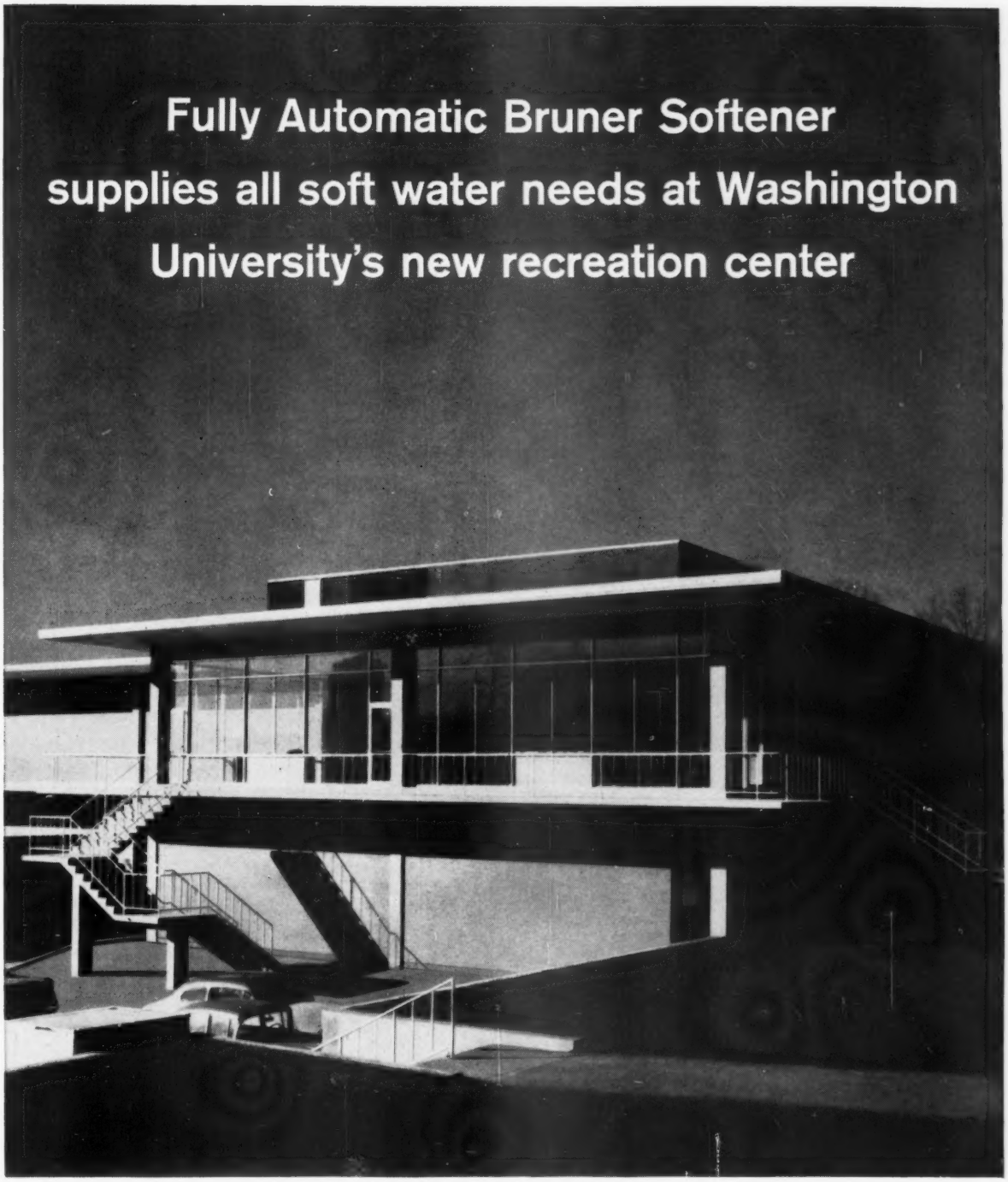
¶ Disposable textiles and ultrasonic cleaning in the home will replace dry cleaning establishments and commercial laundries. The refrigerator will be supplanted by thermoelectrically cooled drawers in kitchen cabinets. Electrostatic power will clean the whole house swiftly and almost antiseptically. After irradiation, fresh foods will keep for long periods with only moderate cooling. Cans and frozen packages will disappear. Food will be cooked electronically in a matter of minutes. Lighting fixtures will be replaced by electroluminescent panels, which will give any color and intensity of light at the twist of a dial.

¶ There will be machines that automatically translate foreign languages, written or spoken, so that conversations can be carried on as swiftly as if a single language were spoken. Stenographers will disappear, to be replaced by typewriters that directly transcribe the spoken work. Radio receivers will be made of a solid material, grown as a crystal to provide the necessary circuitry. Pocket size TV sets will be available. World-wide TV in color will be commonplace.

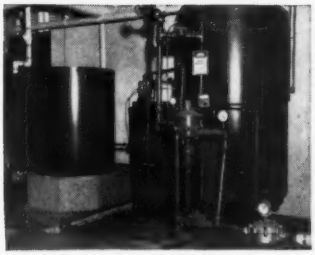
¶ There will be drugs to alleviate cancer, and many of the infectious diseases we know today will be gone. (However, mutations of the pathogens may still plague us.) Most of the expensive drugs derived today from natural sources will be synthesized and will be cheap. Medical examinations will be conducted more swiftly, cheaply, and accurately by special electronic computers.

¶ Mechanical drawings will disappear because automated machinery will not be able to read them. Information and instructions will be placed on tape to direct and control fully automated production machinery. Design for such standard items as machine parts and heat exchangers will be done more economically, swiftly, and efficiently by computers. Engineers will be actively engaged in the design of prosthetics, replacement anatomical parts, biophysical systems, and other items which had been

Fully Automatic Bruner Softener supplies all soft water needs at Washington University's new recreation center



Architects for the Center: Hellmuth, Obata & Kassabaum, Inc., St. Louis Mo.
Plumbing contractor: E. J. Fischer Plumbing Co., St. Louis, Mo.



Bruner has provided the first water softener on the University campus in St. Louis for the David P. Wohl Center, a dining and recreation hall able to serve 1200 students 3 times a day. This fully automatic Bruner water softener features a reset head meter and automatic by-pass for ease of operation and maintenance, providing soft water for washing over 4000 dishes daily. Here, and across the U.S., leading engineers specify Bruner water softeners, America's most complete line.

FULL INFORMATION IS AVAILABLE FROM BRUNER SALES OFFICES IN ALL MAJOR CITIES. BRUNER CORPORATION, 4767 NORTH 32ND STREET, MILWAUKEE 9, WISCONSIN. PLANTS IN MILWAUKEE, WISC., AND LOS ANGELES, CALIF.

BRUNER
WATER SOFTENERS & FILTERS

ignored previously. Highways will be revolutionized with the advent of hover craft and remotely operated high-speed vehicles.

¶ In the field of education, we shall see two-thirds of university faculties composed of scientists and technologists. The difference between basic and applied research will become so fuzzy that the two will be almost indistinguishable. Many of the special schools in universities will have disappeared. Engineering as we know it today will have passed from the university scene, and even the word engineer will have an entirely different meaning. The organization man in university administration will disappear, and be replaced by the man of imaginative leadership, the man who has the intellectual introspection to know where he is leading the youth of the nation. Big-time intercollegiate sports will disappear, and be remembered the way we remember the roaring twenties. More people will visit art galleries or attend concerts than attend athletic events (this is almost true now). There will be 11 million college graduates in 1970.

An End to Conformity?

These anticipated changes raise many questions about the ability of industrial leadership to keep pace. We are just leaving the era of the organization man who can be described as a strict conformist. Characteristically, he plays it safe, settling for a modest advance annually. Perhaps the recent presidential campaign, with two youthful contenders, was the symbolic end of the era of conformity. It was patently clear to everyone, regardless of political persuasion, that the old cliches, the well followed patterns of the past, and the "safe" outlook would not meet the needs of the times. We are facing an uncharted future requiring the type of individualistic thinking and action characteristic of a democracy. There is abundant evidence that industrial management is be-

KNOW YOUR SYMBOLS

This symbol stands for bus duct

This symbol stands for QUALITY

NOW... BullDog plug-in duct hangs up to 50% faster

with new HANGFAST® Adapter

New HANGFAST Adapter bolts quickly and tightly to suspension rod end . . . duct with standard hanger engages HANGFAST Adapter hook instantly . . . hanger bolt spins tight fast for a lasting, secure installation. Result—you can save as much as 50% in hanging time . . . end time-consuming bracket fabrication, too! And you can use the new HANGFAST Adapter with all types of BullDog industrial plug-in duct systems—XL, BD and LO-X®. Ask your BullDog Field Representative for a demonstration. Or write for details.

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BULLDOG ELECTRIC PRODUCTS DIVISION

coming aware of the need for more individualism in plotting industry's future course.

One of the effects of the age of conformity was the attraction of conformists to the safety of the large corporation. The ability to get along nicely with one's col leagues, a shallow but well rounded view of the world, and the patience to move with the team were prime requisites for the junior executive. Fortunately, the individualist was drawn to the small, progressive, and scientifically oriented firm where he had to take his chances. Many small firms grow in leaps and bounds, thriving on the new ideas flowing freely within their organizations. In many instances, one or two ideas made these firms great. It was not too long before the larger firms were threatened by competition.

It is strange that conformity became so widespread in the United States. Conformity is the cornerstone of a totalitarian state; individualism is the cornerstone of a democracy. The spirit of individualism has made American industry the marvel it is. Even the Russians, in order to advance technologically, have had to tolerate a certain amount of individualism in their scientists. There, the toleration of individualism is a matter of expediency. Here, individualism is fundamental to our whole idealogy. This is the land of the Fords, the Carnegies, the Mellons, the Lincolns, the Jeffersons, the Diamond Jim Bradys, the Trumans, the General Pattons, the Henry Adamses, and other nonconformists.

We need to resurrect the spirit of Edison, Bell, Morse, Langmiur, Steinmetz, De Forrest, Firestone, Westinghouse, and other individualists in science and technology. This spirit, which cannot be found in brain-storming committees or in team research, is essential if we are to maintain our competitive position in world markets without losing our high standard of physical well being. ▲▲

QUICK REFERENCE GUIDE

Diversified line of YORK Air Conditioning and Refrigeration Systems and Equipment . . . Designed for today's specialized applications in temperature-humidity control and air distribution.

YORK® CORPORATION
Subsidiary of Borg-Warner Corp.
YORK, PENNSYLVANIA

YORKAIRE 3-PIPE SYSTEM

Delivers Heating or Cooling instantly to any Induction or Fan-Coil Unit in a Multi-Room Building

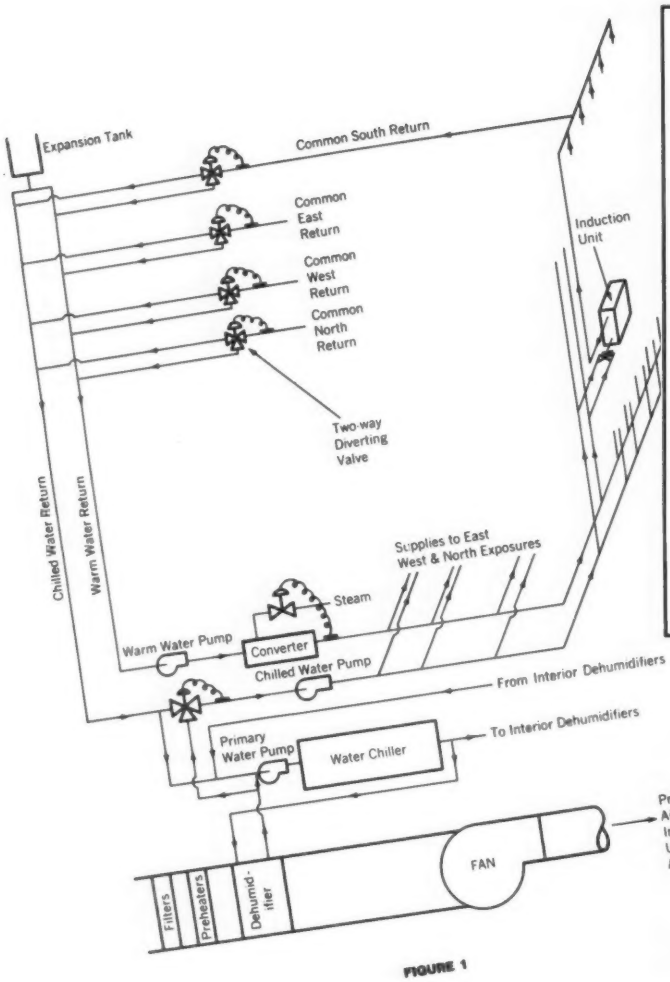
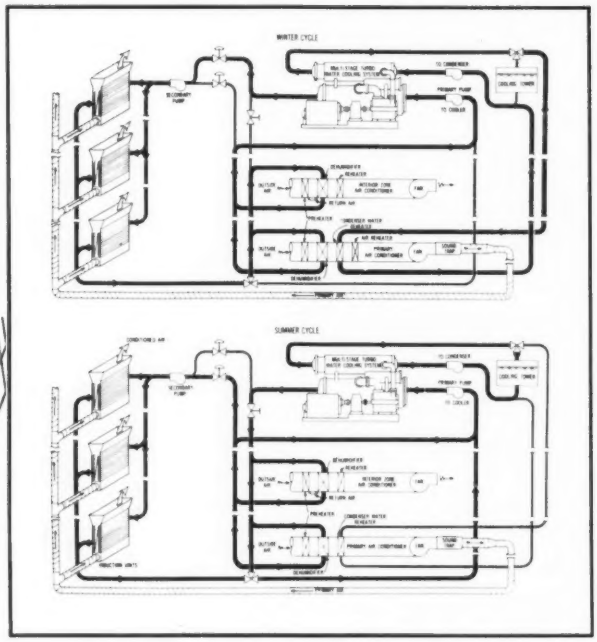
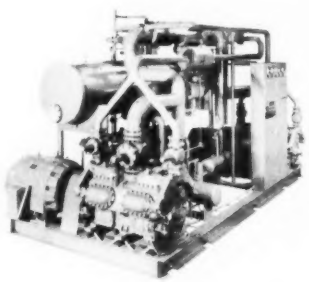


FIGURE 1





At left: Schematic diagram of Yorkaire 3-Pipe System with primary air supply.

Upper right: Schematic diagram of hot and chilled-water systems.

Lower right: View of York Heat Pump for Yorkaire 3-Pipe System.

Yorkaire 3-Pipe Systems provide unparalleled personal comfort. The occupant of each room in the building has a choice of either instant heating or cooling and ventilation when he dials his fan-coil or induction conditioner. The control valve modulates the flow of either hot water for heating or chilled water for cooling.

Costly reheaters and return air ducts are eliminated. Since primary air requirements are reduced, a considerably smaller equipment room is needed . . . freeing valuable space for other uses. Besides providing the ultimate in zoning, the entire system is unequalled for space-saving features.

YORK CONDITIONERS

Supply air for YORKAIRE 3-Pipe Systems, Conventional and Perimeter Installations

YORK HI-I

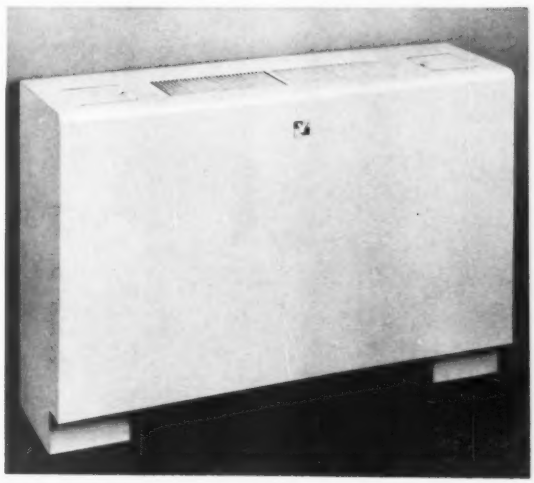
INDUCTION CONDITIONERS

York Hi-I Induction Units more than double the flow of conditioned air and sensible cooling capacity by providing High Induction of room air. This is especially important in the modern building where large glass areas and high intensity lighting create greater cooling requirements than were previously known.

With H-I induction units it becomes possible to safisfy these greater cooling requirements with a primary air system sized to meet only the minimum ventilation requirements. This reduces the equipment-space requirements throughout the building. Also, the Hi-I induction units are easily applied and installed either wall hung or floor supported. Both of these features reduce initial and installation costs below those required by conventional induction units.

YORK UNIVERSAL

FAN-COIL CONDITIONERS



New in 1961—York's UNIVERSAL line of room fan-coil air conditioners provides a wide range of models for all applications. All models are designed for quick, low cost installation. For example, ceiling hangers permit one man installation of horizontal models.

Available in four basic model sizes—200, 300, 400, 600 cfm—all models are listed with Underwriters Laboratories.

Floor Supported Basic Model
Wall Supported Basic Model
Ceiling Basic Model
Ceiling Plenum Basic Model

Available in five decorative enclosure types finished in owner's choice of four baked enamel finishes to blend with any room decor.

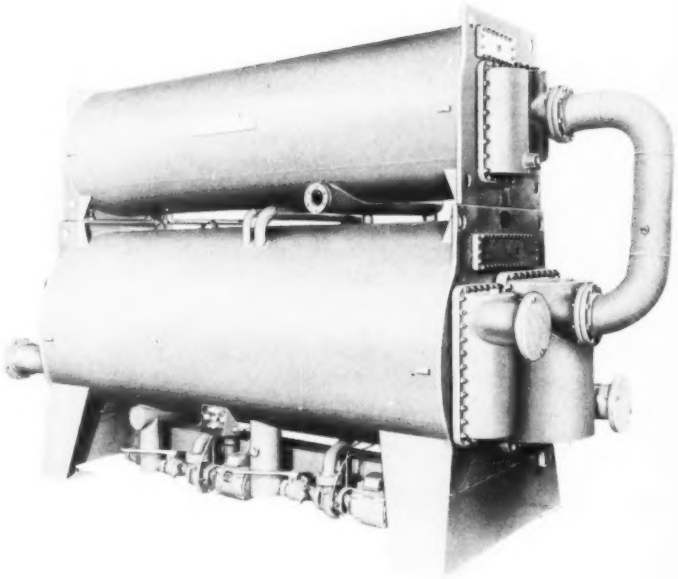
Floor Enclosure
Semi-Recessed Enclosure
Off-The-Floor Enclosure
19″ Sill Height Enclosure
Ceiling Enclosure

Let your York representative demonstrate to you how this wide application selection can save you money, both in system design and installation.

YORK WATER CHILLERS SUPPLY
INCLUDING YORKAIRE 3-PIPE SYSTEMS

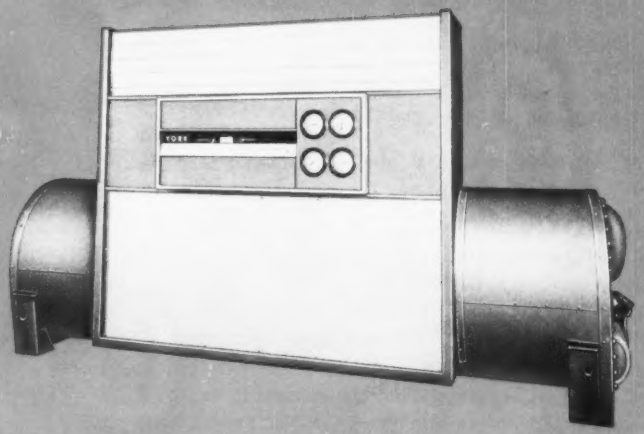
YORK ABSORPTION SYSTEMS

York Absorption Systems provide chilled water for air conditioning and process refrigeration. Operation is economical, using hot water or low-pressure steam. Capacity can be varied economically according to demand, from overload to as little as 10% capacity. Operation is quiet; maintenance is simple—three small pumps with motors are the only moving parts. Capacities 50 to one thousand tons.



YORK TURBOPAK

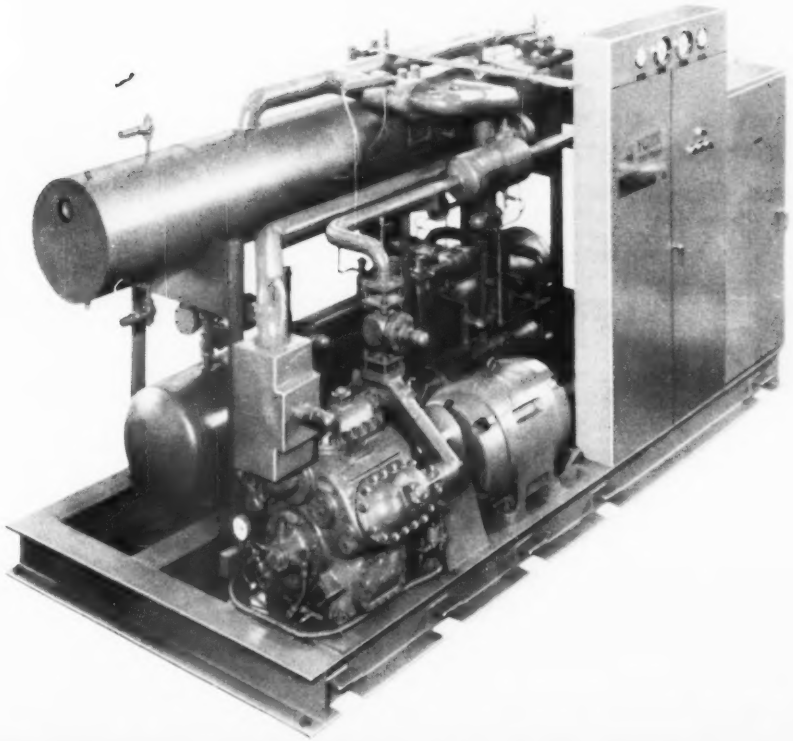
York Hermetic Turbopak Centrifugal Water Chillers provide cold water for air conditioning. Operation is quiet. Factory assembled, pre-wired, and designed to reduce floor space, weight, and installation work. Capacities from 65 to 600 tons.



COOLING FOR ALL AIR CONDITIONING SYSTEMS AND CONVENTIONAL INSTALLATIONS

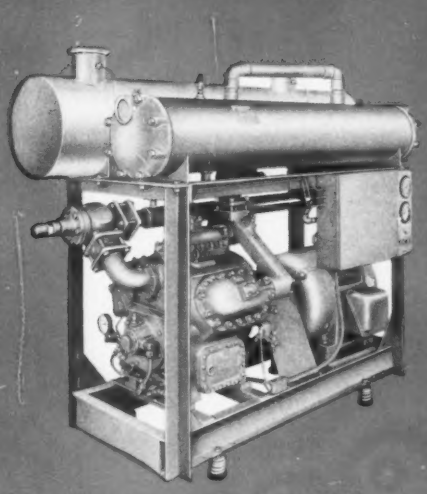
YORK HEAT PUMPS

York Heat Pumps provide both hot and cold water for air conditioning. They can cool sunny rooms and "pump" the heat to warm the shady rooms, all thermostatically controlled. Using only outside air and incoming power lines, installations are practical in cold as well as warm climates since York's multi-stage compression extracts heat from sub-freezing air. Capacities are from 50 to 150 tons, and 280 to 1,230 MBH in factory packages or custom designed to meet other requirements. Turbomaster Centrifugal Compressors extend the range to 1700 tons and larger.



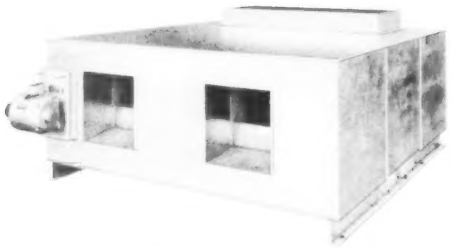
YORK PACKAGED WATER CHILLER

A complete line of York Packaged Water Chillers to provide cold water for air conditioning and process refrigeration. Operation is based on product load . . . compressor step-unloads with power savings almost directly proportional. Capacities to 200 tons.



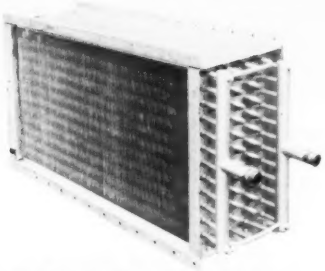
YORK CENTRAL STATION AIR CONDIT

Treat and circulate air for comfort or process work with



YORK CENTRAL STATION AIR CONDITIONERS

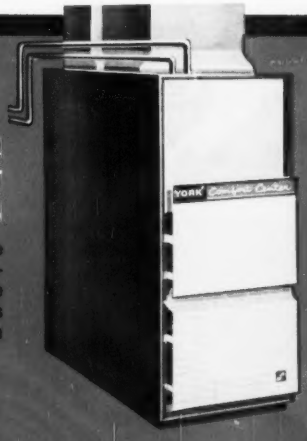
York Central Station Conditioners filter, cool, heat, humidify, dehumidify, and circulate air for comfort or process work. Horizontal, vertical, and multi-zone units. Capacities: 800 to 36,000 cfm.



YORK COILS York Hi-Eff Finned Cooling and Heating Coils feature high efficiency heat transfer and quality construction, designed for application ease . . . for chilled or hot water, brine, direct expansion refrigerants, standard and non-freeze steam.

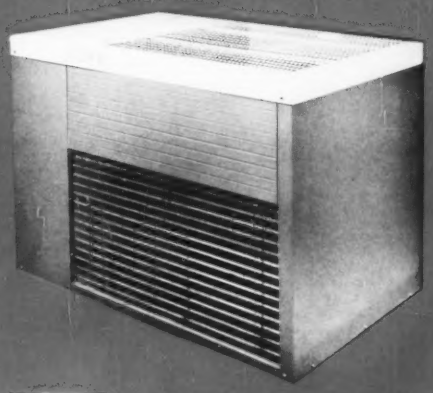
YORK PACKAGED AIR CONDITIONERS utilize

comfort . . . by closely coordinating



YORK COMFORT CENTERS

York Comfort Centers provide residential and gas-fired heating. Electronic filters clean the air. Capacities: 3 to 5½ tons cooling; 80,000 to 160,000 Btuh heating.



YORK CHAMPIONS

York Champion Air Conditioners and Air-Cooled Condensing Units have up to three compressors and three fans in step sequence. Dual coils sub-cool the refrigerant. Makes possible comfort cooling even when it's zero outdoors. Available in models for ceiling suspension. Capacities: 5 to 22½ tons.

YORK EMBASSY UNITS

York Embassy Air Conditioners, ducts optional, provide residential or commercial cooling, which varies with load for economy. Capacities: Packaged water cooled systems—3 to 33 tons cooling; 34,000 to 645,000 Btuh heating.

IONING and CONDENSING UNITS

aid of Air-Cooled, or Evaporative Condensers

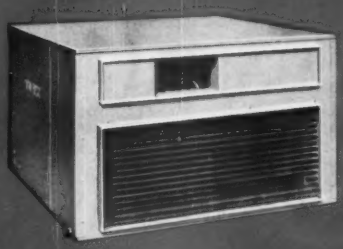
YORK ECONOMIZERS

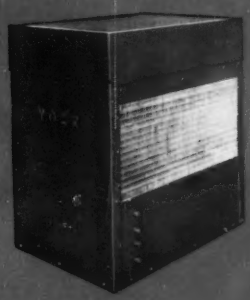
York Economizers (evaporative condensers) combine the advantages of a water-cooled condenser and cooling tower usually at less cost, less space, less weight. Install indoors or out. Sectionalized. Capacities: 5 to 150 tons.

"Balanced Cooling" for complete all phases of system

YORK PATHFINDERS

York Pathfinders with twin compressors, are designed for residential and commercial air conditioning. Twin compressors have step sequence for trouble-free operation and economy. Air cooled. Capacities: 2 to 4 tons.



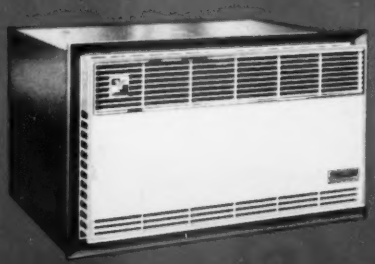


YORK TWINLINES

York Twinlines provide residential, commercial cooling. Remote heat exhaust section goes outside the building, cooling coil above furnace or in ductwork. Two, step-start cooling systems save up to 30% on operating costs. Capacities: 3 to 5½ tons.

YORK ROOM AIR CONDITIONERS

York Room Air Conditioners provide cooling and heating, with automatic temperature control. Fresh-air intake, and exhaust. Capacities: 6,500 to 18,000 Btu cooling.



Wherever you go... THOSE WHO DEMAND THE FINEST IN AIR CONDITIONING AND REFRIGERATION CHOOSE YORK

Air Conditioning

Allen Manufacturing Co.
Bloomfield, Conn.

Birch Towers
Ft. Lauderdale, Fla.

Carson, Pirie, Scott & Co.
Chicago, Ill.

Conrad Hilton Hotel
Chicago, Ill.

Flick-Reedy Corporation
Bensenville, Ill.

Foley's
Houston, Texas

Fulton National Bank
Atlanta, Ga.

Illinois Power Co.
Decatur, Ill.

Insurance Company of North America
Richmond, Ind.

Maryvale Shopping Center
Phoenix, Ariz.

Mile High Center
Denver, Colo.

Nationwide Inn
Columbus, Ohio

Statler-Hilton Hotel
Boston, Mass.

Sylvania Electric Products Co.
Amherst, N. Y.

3 Penn Center Plaza
Philadelphia, Pa.

300 Park Avenue
New York City

Refrigeration

Greensboro Ice Cream Co.
Greensboro, Md.

John Morrell Co.
Sioux Falls, S. D.

Pacific Fruit Express Co.
Ogden, Utah

Shell Oil Co.
Deer Park, Texas

Sinclair Refining Co.
Wellsville, N. Y.

Wissahickon Skating Club
Philadelphia, Pa.

Wyandotte Chemicals Co.
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Cleveland 5, 3121 Euclid Ave.
Columbus 24, 1273 Carbone Drive

PENNSYLVANIA
Philadelphia 2, Three Penn Center Plaza
Pittsburgh 22, 1613 Penn Ave.

TEXAS
Dallas 2, 1707 Cedar Springs Road
Houston 1, 2201 Texas Ave.

Heard Around Headquarters

MARJORIE ODEN
Eastern Editor

Merger Vote Hangs Fire

The proposed merger of the Engineers Joint Council and Engineers Council for Professional Development depends now on the vote that will be cast by the National Council of State Boards of Engineering Examiners.

To conclude the merger, ECPD must have the approval of at least six of its eight members. Right now, the vote stands five to two in favor of the merger. The two Founder Societies that are in favor of the Functional Plan for Unity, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, opposed the EJC plan. The five who have supported it are the American Society of Civil Engineers; the American Institute of Mining, Metallurgical, and Petroleum Engineers; The Engineering Institute of Canada; the American Society for Engineering Education; and the American Institute of Chemical Engineers.

At a December meeting, NCSBEE asked for more information before announcing its vote on the proposed merger. There was some surprise among the other groups at that time, since the plans already had been discussed for nearly a year. Also, no one knew then how close the vote would be. The National Council of State Boards of Engineering Examiners, already unpopular in some quarters for its adoption of the Model Law, apparently will make new enemies no matter which way it votes on the merger.

New York's Leaning Wall

The staid Engineers Club, in New York City, has been given 90 days notice on its back wall. Someone sold it.

Back in 1914, the Engineers Club was given permission to lean on the Engineering Headquarters Building. The Club was built on United Engineering Trustees property, and it was agreed that if UET ever sold headquarters, the Club would be given 90 days notice on the wall.

The Headquarters sale also removes restrictions limiting the Engineers Club property to structures "not exceeding 60 feet in height." Now, the sky's the limit.

International Meeting

In 1938, the Iron and Steel Institute of Great Britain planned a meeting in the United States, but then came threats of World War II and the meeting was postponed. In October, of 1961, the British group will gather in the U. S. for the first time since 1910. Host will be the American Institute of Mining, Metallurgical, and Petroleum Engineers. Detroit, the meeting site, will be a busy place. The British Institute sessions, the AIME

annual dinner, and the Metals Congress (sponsored by the American Society for Metals) will all be held at once.

Tradition Bound

About 10 years ago, the American Society of Civil Engineers, the National Society of Professional Engineers, and the American Institute of Architects decided to draw up a joint contract form for architects and engineers. A few years later, ASCE withdrew.

NSPE would not give up. In June 1958, CONSULTING ENGINEER reported "AIA spokesmen . . . hope to have the approved contract available for distribution at the July convention in Cleveland."

At its 1959 winter meeting, NSPE agreed to publish the forms without AIA approval, noting that the subject had been "on the agenda at the last AIA board meeting," but no report of action had been received yet by NSPE.

Now AIA again has scheduled a discussion of the contract forms – in the traditional place on the program of its January meeting.

More Fair Prospects

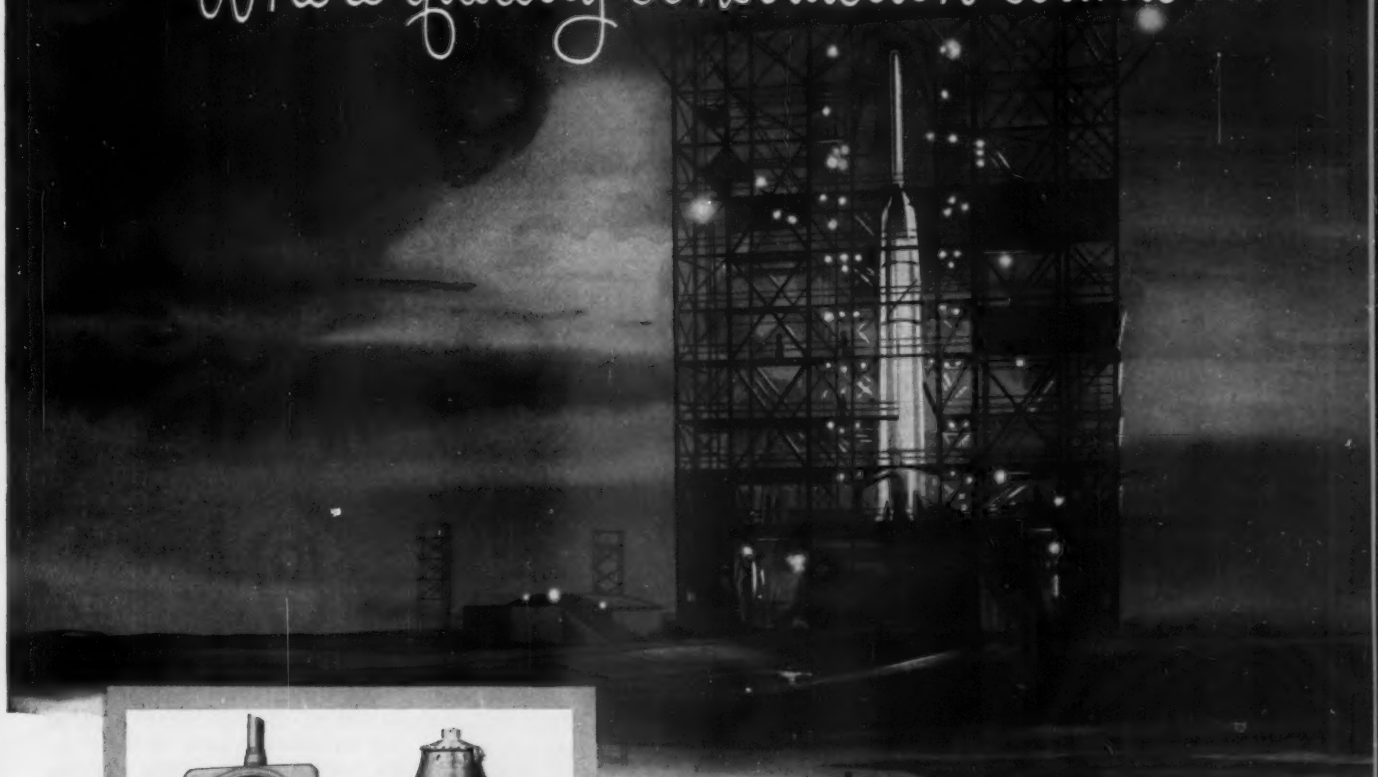
Four more countries have announced they plan to have buildings at the 1964 World's Fair near New York City. They are Argentina, Paraguay, Israel, and Uruguay. Recent additions in the industrial area are the American Petroleum Institute and Owens-Corning Fiberglas.

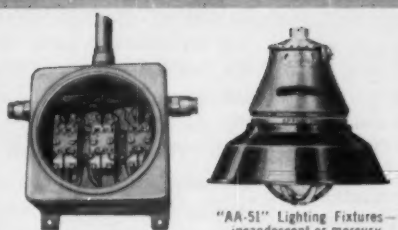
The Cautious Way

In November, it was announced that Engineers Joint Council was to publish a book called *Professional Liability and Responsibility* – the first report to come from the EJC-American Institute of Architects joint committee. EJC had carefully "accepted," but had not "approved," the report in the hope of cutting red tape.

AIA was expected to do the same. Instead, AIA requested that the report not be published at

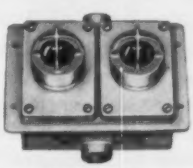
Where quality construction counts...





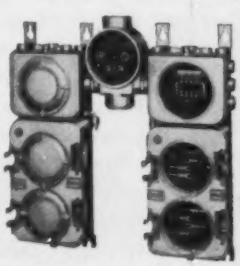
Type "GUB" Unilets—where junctions are required

"AA-51" Lighting Fixtures—incandescent or mercury vapor lamp type . . . more light, at less cost



"EFD" Series—dust-tight pilot light and switch Unilets

"SFN" Sealing Unilets—for sealing off conduit systems at required points



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this time. AIA will do a series of stories based on the report and publish the articles in the official AIA magazine. EJC also plans to release portions of the report to any interested publications.

The book is an excellent compilation of all available standard documents used by architects and engineers. The weaknesses and good points of the various contract forms are analyzed. The report also gives pointers on how an engineer can evaluate his professional liability insurance policy.

The reason for the delay is that neither engineers nor architects want to be thought guilty of rendering expert decisions on legal matters. Contract forms might be considered by some to be slightly in the gray area between law and engineering or architecture.

Old Aim, New Approach

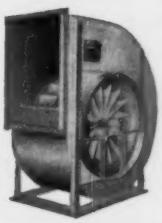
The McCamy case in New Jersey, in which architects are attempting to convict an engineer of practicing architecture (and in the process, set a legal precedent defining architecture in the broadest possible terms), still is a virtual deadlock. There is a rumor that now the architects are trying different methods to get the same results.

In 10 states — Alaska, Arizona, Michigan, Minnesota, Missouri, Nebraska, South Dakota, Tennessee, Virginia, and Wisconsin — architecture and engineering is governed by a single board. The architects are expected to request separate boards — a request that appeals to politicians with unemployed cousins. The catch is that the architects then will proceed to define architecture. First states in which this is expected to be tried are Missouri and Virginia.

Three national organizations — the American Institute of Consulting Engineers, the Consulting Engineers Council, and the American Society of Civil Engineers — have adopted a resolution stating that the owner of a building should be free to decide whether he wants

'BUFFALO' AIR HANDLING EQUIPMENT

VENTILATING FANS — TYPES "BL" AND "BLH": Quiet, efficient, non-overloading performance. Give completely stable performance from free delivery to shut-off. "BL" designed for moderate pressures (Classes I-II). "BLH" designed for high pressures (Classes III-IV). To minimize turbulence, both types feature smoothly-curved inlet bell with directional guide vanes, wheel with full curvature shroud matching the inlet bell and streamlined, wheel-contoured housing. "BLH" has divergent outlet, further reducing turbulence. Capacities: 1,000 to 500,000 cfm. *Write for Bulletins F-104 and F-201.*



POWER ROOF VENTILATORS: High-efficiency Style "H" Sky-Vents ventilate, heat and/or cool large open plant areas. Fewer large capacity units are needed, thus reducing installation costs. When used for exhausting, stale air can be replaced, heated and/or cooled by 'Buffalo' Makeup Air Units. Sky-Vents are easily-installed, weatherproof "packages." Extensive or expensive duct work is held to a minimum. Capacities: 1,000 to 250,000 cfm. *Send for Bulletin FM-2345.*

AIR COOLED CONDENSERS: Provide highly efficient, economical, trouble-free cooling for air conditioning, steam condensing, jacket water cooling and many other applications. These easily-installed units have vertical discharge, low silhouette. Standard Capacities: 7½ to 100 tons based on 120° condensing temp., 40° suction, 100° ambient. Larger sizes on special order. *Write us for complete facts.*

BELTED VENT SETS: Easy-to-install, economical-to-operate "packaged" ventilating fans. Provide quiet, efficient non-overloading operation. Flexible units, ideal for smaller plants or separate areas of large plants. Capacity can be increased after installation to handle expanding ventilation needs. Capacities: 500 to 20,000 cfm. *Send for Bulletin FMB-235.*

AXIAL FLOW VENTILATING FANS: These compact, lightweight units fit into straight, round duct runs. Applications: ventilation, exhausting, system boosting, draft and circulation. Very quiet, efficient and non-overloading. Vaneaxial fans have guide vanes at outlet, to convert swirling air into increased forward thrust. Tubeaxial models (without vanes) also available. May be ordered in various constructions to suit applications. Direct connected drive, or V-belt drive with motor out of air stream. Capacities: 2,000 to 65,000 cfm. *Write for Bulletin 3720-A.*

ZONE CONTROL CABINETS: Ideal for use where a single unit is desired to provide varying degrees of conditioned air for each of several zones. Cooled and heated air is mixed in correct proportions to suit needs of each area. No need for separate reheat coils and their controls. These compact units are quiet, efficient, economical. Adaptable to any combination of heating, cooling and/or dehumidifying. *Write for full details.*

Ventilating Fans (centrifugal, axial flow and propeller), Mechanical Draft Fans, Blowers, Exhausters, Air Washers, Drying Equipment, Air Conditioning and/or Cleaning Equipment, Unit Heaters, Air Preheaters, Packaged Power Roof Ventilators, Makeup Air Units, Spray Nozzles. 'Buffalo' is ready to work with you on any air problem you may have. Call the 'Buffalo' Engineering Representative in your nearest principal city, or write for Bulletins or information.

"Buffalo"

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

an engineer or an architect for his project. A copy of the resolution was sent to the Attorney General of the State of New Jersey for consideration in the McCamy case. The National Society of Professional Engineers also has given McCamy strong backing throughout the hearings.

The AICE-CEC-ASCE resolution points out that engineering and architectural laws are aimed at the protection of the public, not at vesting interest in any professional group. "Both engineers and architects should be free to offer their services for, and to accept prime commissions to execute, any type of project which they are qualified to handle," it states.

More on Corporate Practice

The Washington Industry Committee on Engineering Practices, with a membership of corporations ranging from Boeing Airplane Company to the Washington Natural Gas Company, is planning to request that corporations be allowed to continue the practice of engineering in Washington State.

Two years ago, the Washington legislature passed a bill allowing corporations to register and to practice engineering in the state. The bill expires December 31, 1961.

The Professional Engineers Legislative Committee (described by the Industry Committee as a "militant minority") is campaigning to let the corporate practice bill expire in December. In lieu of this, the PELC would like to see the law amended to include restrictive rules on corporate practice.

Intersociety Exams

The five-year-old American Sanitary Engineering Intersociety Board, formed to give added recognition to specialists in air pollution control, industrial hygiene, public health, radiation hygiene and hazard control, and waste water disposal, will hold certification examinations on May 18. Applications must be filed by April 1.

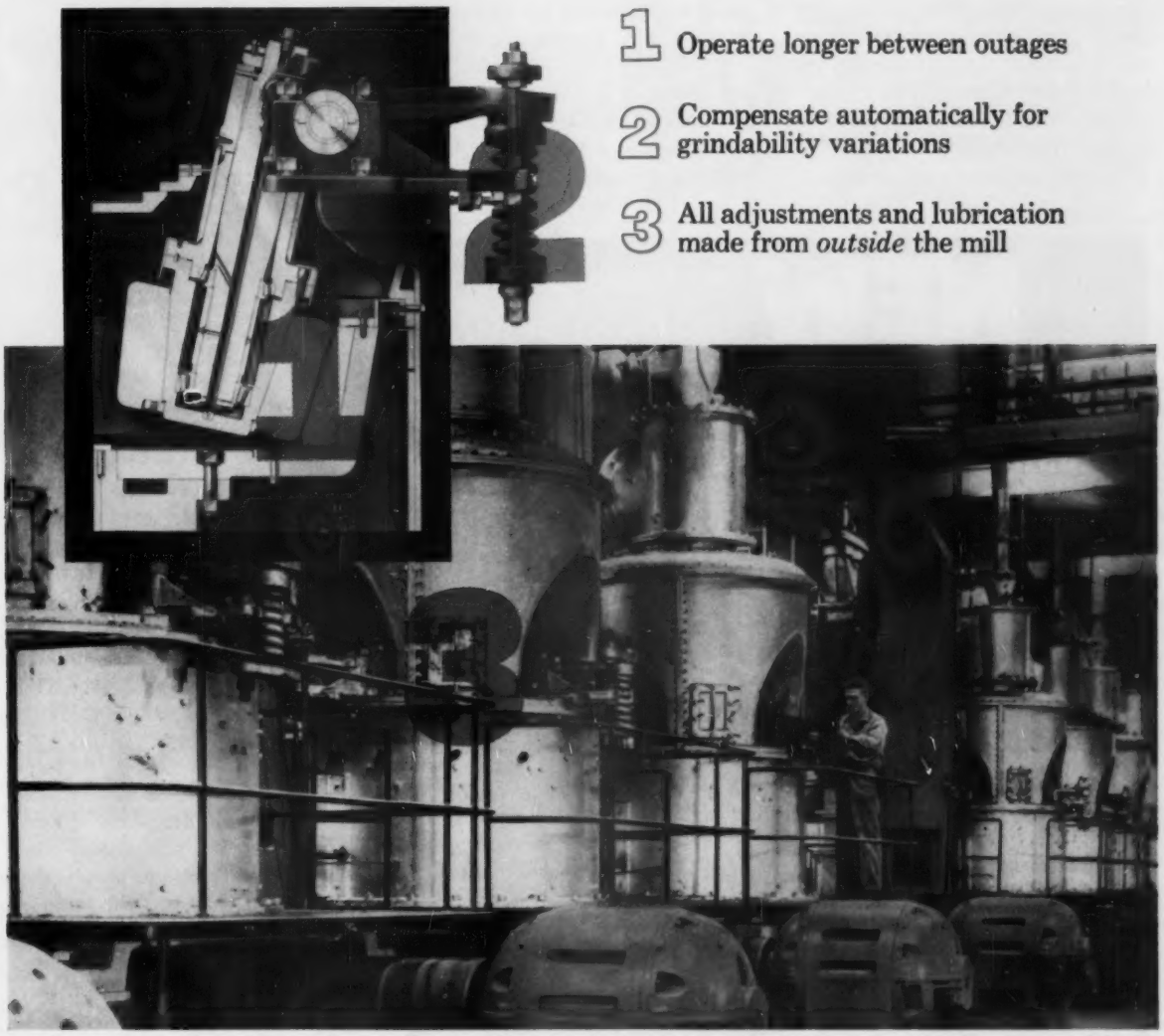
Upon passing the three-part test, the engineer becomes a Diplomate of the American Academy of Sanitary Engineers, which has been endorsed by six other organizations in the field.

To qualify for a certificate, a person must be a graduate engineer, be registered in the U. S. or Canada, have eight years professional sanitary engineering work (including four years in responsible charge), and be of good moral and professional character.

Today's Technical Problems

The engineering problems which American universities and research groups think are the most important and would most like to tackle have been collected and published by the Building Research Institute. BRI spent two years editing reports from various groups, trying to determine the more vital technical needs. The results show

If you pulverize coal, look into these 3 major advantages of C-E RAYMOND BOWL MILLS



1. Operate longer between outages
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3. All adjustments and lubrication made from *outside* the mill

Handles coals of even 50% moisture content quickly...easily

Since 1935, when the C-E Raymond Bowl Mill was introduced, more than 3,000 have gone into service in power plants all over the world. They operate continuously for many thousands of hours with minimum maintenance care.

As the inset shows, there is no metal to metal contact between the grinding elements, even when the mill runs empty. This gives you lower wear, quieter operation, less frequent replacement of parts.

The grinding rolls are mounted on spring-loaded journals which automatically adjust to variations. Fineness control adjustments and replenishment of the lube system are made from outside the mill – without shutting it down.

You can handle coals like lignite – with 50% moisture – trouble free. The incoming raw coal is premixed with coal already dried in an atmosphere up to 800 F air for rapid, thorough drying. And you are assured of low power consumption by the low weight of the grinding elements, quick drying, and rapid flow of material through the mill.

For full details on the many other features of C-E Raymond Bowl Mills write for catalog PC-8.

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ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

that professors and research groups would like to investigate 11 items:

¶ "An evaluation of the Interrelationship of Parameters Affecting Comfort in Domiciles, from Existing Literature" – (University of Hartford). This would involve the design of a "living machine" which could maintain an individually selected environment.

¶ "Study of Prestressed Concrete Under High-Rate Loading" – (Catholic University of America). Dynamic loads are as varied as the projects on which they occur, and require more study. Most research in the past has been only with static loads.

¶ "An examination of the Suitability of Scale Models for Performing Heating and Ventilating Studies" – (University of Illinois). For some reason, actual thermal performance has not followed predicted performance too well in buildings. Construction of full scale structures is prohibitively expensive, so model experiments probably will be used.

¶ "The Compilation of Significant Design and Performance Characteristics of Building Elements as Related to Building Categories and Types and Activity Space Use" – (Southwest Research Institute). An attempt to make future building materials "sympathize" with space and its usage.

¶ "Metropolitan Area Survey of Major Building Features in Residential Construction" – (University of Miami). A program to supplement housing starts data, gathered by the government and expanded to provide manufacturers with product data – at the expense of the manufacturers.

¶ "Solar Curtain Walls" – (Washington State University). Curtain walls might be designed to store solar energy to be used later for heating and cooling.

¶ "Development of a Laboratory Method of Studying Solar Energy Transmission and Absorption in Glass" – (Pennsylvania State University). What materials could best be used in harnessing energy from solar radiation?

¶ "Study of Air Flow Patterns, Speeds, and Pressure Around Groups of Buildings" – (Texas Agricultural & Mechanical College). What happens to air flow around and through one building when that building is influenced by others in the vicinity?

¶ "Computer Techniques for Daylighting Designs" – (University of California). Computers, instead of slide rules and paper work, would be used for selecting luminous sources mathematically.

¶ "A Test of the Validity of the Values Concept Applied to Housing" – (Cornell University). A sociological study to match housing to individual personalities.

¶ "Housing in Relation to Health, Illness, and the Use of Medical Care" – (Temple University). Does a poor community environment make you sick? ▲▲

MAHON MULTI-USE LONG-SPAN M-DECKS

. . . find ready utilization in ambitious Detroit urban-renewal project!

Design for Living, City-Style—Mies van der Rohe's Lafayette Park Development in downtown Detroit. Mahon Long-Span M-Deck was used as the roof system in all 22 low-rise building units. Contractor: Herbert Construction Co., Chicago

Architects and engineers know Mahon Long-Span M-Decks as a valuable ally in curbing construction costs without sacrificing design expression. M-Decks are proven, multi-purpose roof sections that can be functionally used in a variety of ways—even as a *combined structural roof deck and ceiling system.* Why not find out how space-spanning (truss-to-truss) M-Deck can help you . . . your projects . . . your costs? Call in your local Mahon architectural representative or write for the new catalog LSD-61.

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- Aluminum or Steel Curtain Walls (in natural or colored metals)
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- Acoustical and Troffer Forms
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J-94157-1

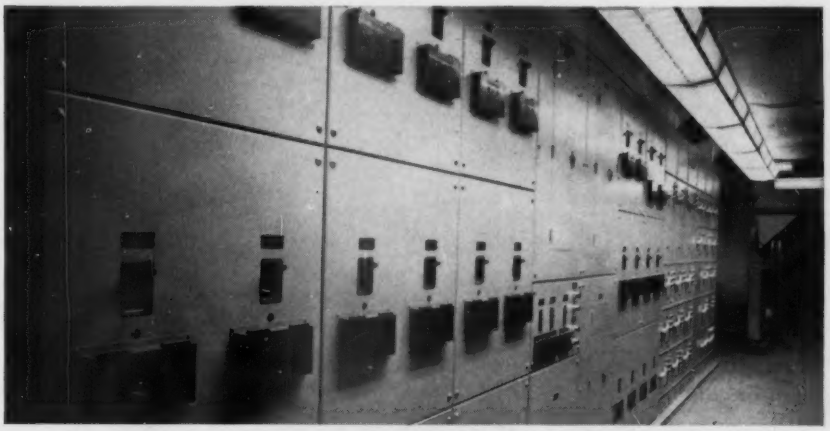
WESTERN-SOUTHERN LIFE GROWTH SPECTACULAR... THEY POWER-UP WITH WESTINGHOUSE

In 1888, The Western and Southern Life Insurance Company issued 11 policies in its first week. Today: six million, five hundred thousand policies in force. Assets and insurance-in-force increased more in the past three years than in the first 45. Result: based on assets, the company is now the nation's 18th largest.

Growth of Western-Southern Life's Cincinnati headquarters has been spectacular. In 1916, the first headquarters building was erected. Additions followed in 1923, '35 and '52. In 1958, a seven-story main building (above) approximating 142,000 square feet provided a major expansion in the company's administration quarters. Now under way: another seven-story structure, slightly larger, to bring total headquarters square footage to 600,000. Forming the power backbone for Western-Southern Life's fast, efficient service to policyholders is coordinated Westinghouse equipment throughout the headquarters complex. For more details, turn the page.

Westinghouse switchboard and control center handle all light and power requirements except refrigeration for Western-Southern Life's main building (at left). Westinghouse Tri-Pac* De-ion® circuit breakers were specified to protect against high fault currents. They provide current limiting protection in addition to time delay thermal trip, instantaneous magnetic trip.

*Trade-Mark



Complimentary meals for 2400 headquarters employes are prepared in this gleaming kitchen. Chef Anton Berta and Fred Welage, Baur Electric Superintendent, discuss convenient CDP distribution panelboard controlling kitchen electrical circuits.

One of quiet, efficient centrifugal fans in air handling system. Unit is exclusive Westinghouse Airfoil blade design. Built by Sturtevant Division, it returns 13,500 cubic feet of air per minute from the cafeteria air conditioning system.

Trade-Mark

Team responsible for newest headquarters building examines model of computer system to be housed in building. Left to right: Harry Hake III, Associate Architect, Harry Hake and Harry Hake, Jr.; H. C. Mode, Vice President, Turner Construction; William C. Safford, President, Western-Southern Life; Frank Niemer, Home Office Buildings Manager, Western-Southern Life; E. C. Baur, President, Baur Electric; C. W. Benz, Westinghouse Area Manager; and O. W. Motz, O. W. Motz and Associates. J-94157-2

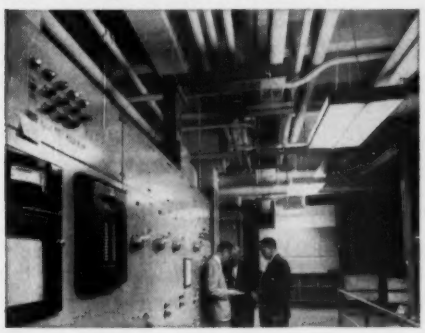
Westinghouse

WESTINGHOUSE HELPS WESTERN-SOUTHERN LIFE KEEP PACE, ELECTRICALLY, DURING NINEFOLD LOAD GROWTH

Messrs. Nagel, Baur and W. B. Motz inspect motor control center in Western-Southern's North annex. The starters these men are examining protect and control all motors and auxiliaries in this area. Foreground: one of four 100-ton refrigeration compressors which have automatically maintained a comfort level of 76° temperature, 45% relative humidity since installation during 1955 modernization. These compressors have compiled a flawless performance record without a moment's down time.

J-94157-3

Westinghouse bus duct, that assures full power at loads, is used in all home office buildings. E. C. Nagel, Westinghouse; E. C. Baur; and W. B. Motz, O. W. Motz and Associates, stand before control center served by 1600-amp low-impedance bus duct.



For 25 years Elmer C. Baur, President of Baur Electric, has applied his expert knowledge of electrical products to the efficient electrification of Western-Southern Life's home office buildings.

Western-Southern Life accelerates accounting, billing and actuarial functions with electronic data processing equipment. Heavy power requirements, typified by punch card section, are reliably met by Westinghouse electrical distribution equipment.

By 1962, the annual electrical consumption in Western-Southern Life's home offices will toe the 8,000,000-kwhr mark—virtually a ninefold increase over 1953's 964,800-kwhr consumption.

During expansion and modernization of the company's headquarters, Westinghouse has been—and is—the major source of electrical apparatus. Westinghouse coordinated switchboards, control centers, bus duct, panelboards and other products handle the huge electrical load efficiently and dependably.

For more information about this single source, single responsibility helping Western-Southern Life Power-Up for growth and service, contact your nearest Westinghouse representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. *You can be sure . . . if it's Westinghouse.*

Westinghouse

Messrs. Mode, Niemer, Baur and Benz discuss a Size 3 combination Life-Linestarter in this Westinghouse control center. Grouping of starters and feeder circuit breakers in one continuous line-up affords centralized control of circuits, simplifies maintenance, provides a pleasing appearance.

OWNER: The Western and Southern Life Insurance Company, Cincinnati, Ohio
ARCHITECT: Harry Hake and Harry Hake, Jr., Cincinnati, Ohio
CONSULTING ENGINEER: O. W. Motz and Associates, Cincinnati, Ohio
GENERAL CONTRACTOR: Turner Construction Company, Cincinnati, Ohio
ELECTRICAL CONTRACTOR: Baur Electric Company, Cincinnati, Ohio
ELECTRICAL DISTRIBUTOR: Westinghouse Electric Supply Company, Cincinnati, Ohio

J-94157-4

The Word From Washington

EDGAR A. POE, Consulting Engineer Correspondent

New Federal Agency?

President Kennedy again stated that he favors creation of an agency designed to coordinate expanded Federal activities encompassing housing, transportation, urban planning and development, and pollution control. An agency or department handling urban affairs probably would become one of the Federal government's biggest construction agencies. Such a department would have authority in the fields of housing, urban redevelopment, highways, and sewage.

President Kennedy has made it absolutely clear that he favors completion of the accelerated national highway program on schedule. He is expected to recommend to Congress that the road construction program be stepped up. The chief executive is also on record favoring Federal grants to the states to be devoted to classroom construction and for teachers' salaries. This proposal, however, will run into sharp opposition.

Raw Material Shortage?

A report growing out of a study by the Canadian-American Committee declares that by 1980 the United States and Canada will need twice the amount of industrial raw materials they now consume. The Canadian-American Committee is composed of 60 leaders of business, labor, agriculture, and the professions.

The expected demand would grow out of an average annual 4 percent increase in consumption of raw materials. The report, released through the National Planning Commission in Washington, D. C., projects consumption of 46 principal industrial materials, for the next two decades, against the available supply of these materials in North America.

The report stated that the supply of nonmetallic structural materials, such as cement, gypsum, lime, sand, gravel, and stone, all show an approximate balance. It is almost inevitable that they must do so because of the nearly prohibitive cost of long distance shipments. The supply-demand balance is relatively good for other nonmetallic metals with the exception of natural industrial diamonds, for which production is neglible in North America; and fluorspar, for which production in 1957 was only about half the demand. The deficit of fluorspar is being met by imports from Mexico, Spain, and Italy.

New Highway Administrator

The appointment of Rex Whitton to the post of Highway Administrator was received favorably by the highway construction industry and by engineers who worked with him when he was chief engineer of the Missouri Highway Department. Whitton had been with the Missouri Highway Department for 40 years. He is a civil engineering graduate of the University of Missouri, a past president of the American Association of State Highway Officials, and chairman of the Highway Research Board.

Secretary of Commerce Luther H. Hodges, who is a strong advocate of the private enterprise system, expressed confidence Whitton will prove an able Highway Administrator. The position carries a yearly salary of $20,000.

The Search for Water

The Office of Saline Water began the new year with more than 50 different contracts, about half with private industry and the remainder with universities or technical institutions, in its accelerated program to convert sea and brackish waters into fresh water on an economical basis. Five demonstration plants in various sections of the country are being built.

Never before has the pursuit of water engaged the toil and talent of so many people in so many places, said officials of the Office of Saline Water. They predict that the greatest challenge of the coming decades will be the task of filling the unprecedented demand for potable water. Many millions of Americans already are faced with a water shortage. Dozens of American cities have outgrown their available water supplies,

There's no fine print in Onan's pricing policy!

'Strip-downs' and 'price-adders' are getting out of hand in the electric plant industry. There have always been a few who have sold strictly on price, and of course, got the price down by stripping equipment of essential components.

Today, some leading manufacturers are stripping-down their electric plants.

These stripped-down prices *are* attractive. But when you add the cost of such essentials as oil and water pressure gauges, battery-charging ammeter, over-speed shutdown, radio suppression, flexible exhaust tubing—*even mufflers!*—what happens to your bargain price? You're right—you wind up paying more.

Onan has never produced a stripped-down model, has never used essential operating accessories as 'price-adders.'

Today, more than ever, it will pay you to go over electric plant prices with an eagle eye. *Compare Onan prices with others before you buy.* (But read the fine print.)

C. W. Onan, President

Onan Electric Power Plants are available in sizes from 500 to 230,000 watts.

World's leading builder of electric power plants

ONAN Division, Studebaker-Packard Corporation, 2663 University Avenue S.E., Minneapolis 14, Minn.

and the Department of Commerce estimates that 42 percent of the municipal water supplies in this country do not serve their communities adequately.

What about the future? "It is my sincere belief," said a spokesman for the Office of Saline Water, "that by 1980, one thousand progressive communities along the coastlines will be using a water conversion plant for part or all of their water supply. . . If truly low cost sea and brackish water conversion can be developed it will provide an inexhaustible source of supply more than sufficient to meet every conceivable future demand for fresh water."

World Bank Affiliate

A new affiliate of the World Bank, the International Development Association, has been created to finance economic growth in underdeveloped countries.

The president of the World Bank, under the IDA Articles, is ex-officio president of IDA and chairman of the IDA executive directors. IDA membership is open to any World Bank member. The countries that have accepted membership include: Australia, Canada, China, Germany, India, Iran, Italy, Jordan, Malaya, Norway, Pakistan, Philippines, Spain, Sudan, Sweden, Thailand, Union of South Africa, United Arab Republic, United Kingdom, United States, Viet-Nam, and Yugoslavia.

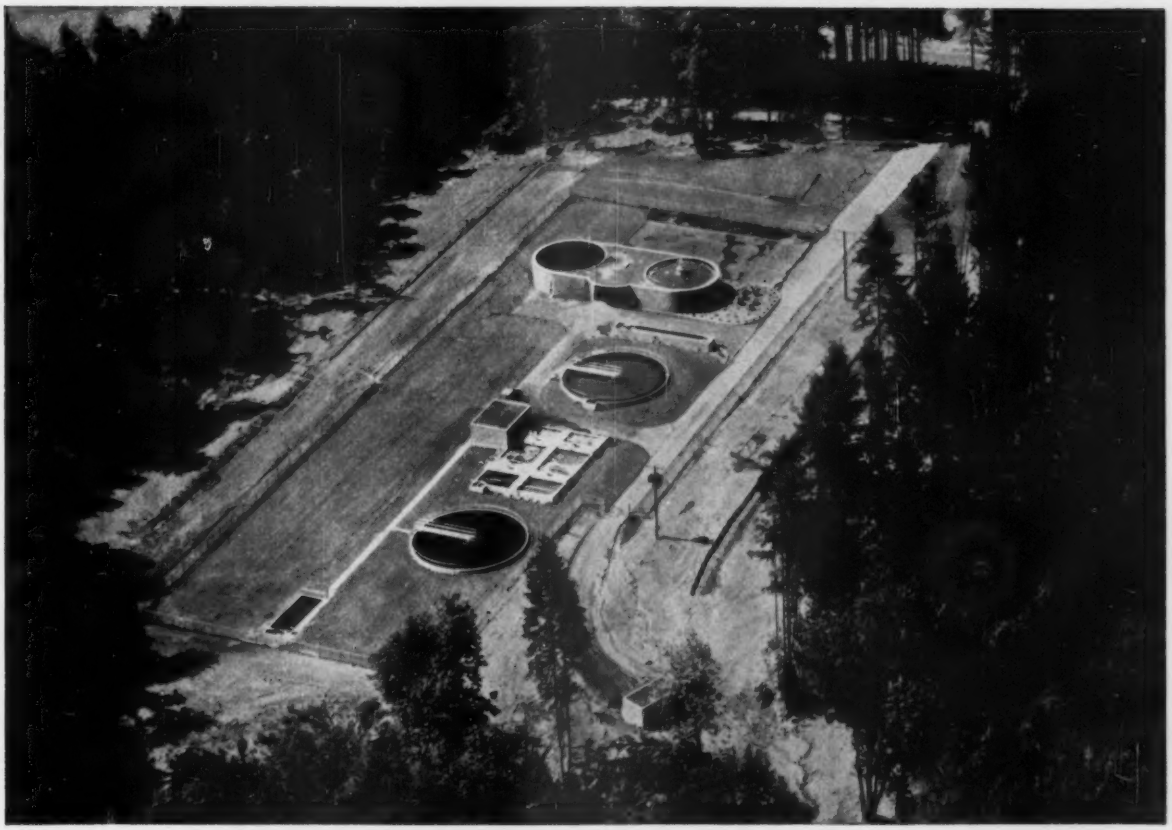
A number of other countries of Latin America, Europe, Asia, and Africa are expected to become members. If all members of the Bank should join IDA, its initial subscriptions would total the equivalent of $1 billion. Subscriptions of the initial 22 members total approximately $726,720,000, and are payable in annual installments over a five-year period.

The International Development Association may finance a wider range of projects than the World Bank. These include projects which are not revenue-producing or directly productive. The only requirement is that the projects must have high development priority.

With all Latin American countries underdeveloped and needing investment capital, the Kennedy Administration apparently is going to give more attention to our neighbors to the south than they have been accorded in the past. There are indications that President Kennedy may name a roving ambassador to the Latin American countries.

More and more our government has begun to realize that the needs are the greatest where private enterprise is most unwilling to risk capital. Certainly there are areas where private enterprise should not be expected to assume all risks. Indicative of this are the great losses which have been chalked up by a number of our large companies.

Practically every Latin American country needs funds to develop highway and transportation systems, power, hospitals, schools, and sanitation. On the other hand, all Latin American countries are producers of



Hillsboro, Oregon, adopts Activated Sludge Treatment with

D-O AERATORS

A high degree of treatment, made necessary by minimum river flow during the summer and the presence of parks, picnic grounds and swimming areas downstream, is achieved in this 1.25 MGD activated sludge plant for the City of Hillsboro, situated west of Portland, Oregon. Overall B.O.D. reduction is well in excess of 90%.

Key to successful operation is the use of the D-O Aerator – a radically new design providing exceptionally high oxygen absorption efficiency, with virtually no problems of clogging and maintenance. Treatment units include 45′ dia. Dorr Primary and Final Clarifiers and four D-O Aerators. Two Aerators are installed per basin. Each basin is 56′ long x 18′6″ wide x 15′ s.w.d. to provide a liquid design detention of three hours. For information on the new D-O Aerator, write for Bulletin No. 7316 to Dorr-Oliver Incorporated, Stamford, Connecticut.

Consulting Engineers: Stevens and Thompson, Portland, Oregon.
Contractor: Lloyd B. Reed, Portland, Oregon.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

raw materials for export, and some depend on only one or two commodities to earn the foreign exchange needed to buy the capital and consumer goods so vital to economic development.

Florida's Highway Scandal

With the opening of the new year, Representative John A. Blatnik, Democratic of Minnesota, prepared to conduct additional hearings into alleged irregularities involving the Nation's highway construction program. As chairman of the House Special Highway Investigating Committee, the Minnesota Congressman declared that there has been a substantial amount of corruption in connection with the vast program. He expressed confidence that his Committee will be able to perform a public service to the road building industry and to the taxpayers by its intermittent investigations of the highway program.

Most recently, the practice of contractors who paid regular gratuities to engineers of the Florida State Road Department was exposed by witnesses appearing before the Blatnik Committee. Before the Committee began its hearing, Florida officials had discharged 14 engineers of the State Road Department, and barred a large contractor, Cone Brothers, from further bidding on highway contracts in the State.

Testimony indicated that some state engineers received $25 a week in unmarked envelopes. Others allegedly received free turkeys, hams, and whisky – and sometimes money. However, those named as recipients of the gifts vehemently denied that they had been influenced.

A payroll clerk for Cone Brothers, Creighton R. Brown, told the subcommittee that when he started to work for the Tampa based company in 1928, he was instructed to place $25 in cash in unmarked envelopes and dispatch them each Friday to certain individuals. A onetime Cone Brothers bookkeeper, Otto Karl Heider, testified that the practice of gratuities was already in effect when he joined the company in 1953. Heider said the number of persons receiving weekly stipends varied from three to eight. He acknowledged that both he and Brown were aware that the names on the list were those of engineers from the State Road Department.

Malcolm L. Kimble, a former $10,000 a year assistant division construction engineer, who had been with the department for 28 years, testified that he did not recall when he first received an envelope bearing $25 in cash. He said the first envelope came with a Cone Brothers letterhead, but all subsequent envelopes bearing the cash gratuities came in unmarked envelopes. Investigators for the Blatnik Committee said records of Cone Brothers showed that Kimble had received more than $4000 since 1957.

Kimble told the Committee that it has long been the "general practice" in Florida for highway con-

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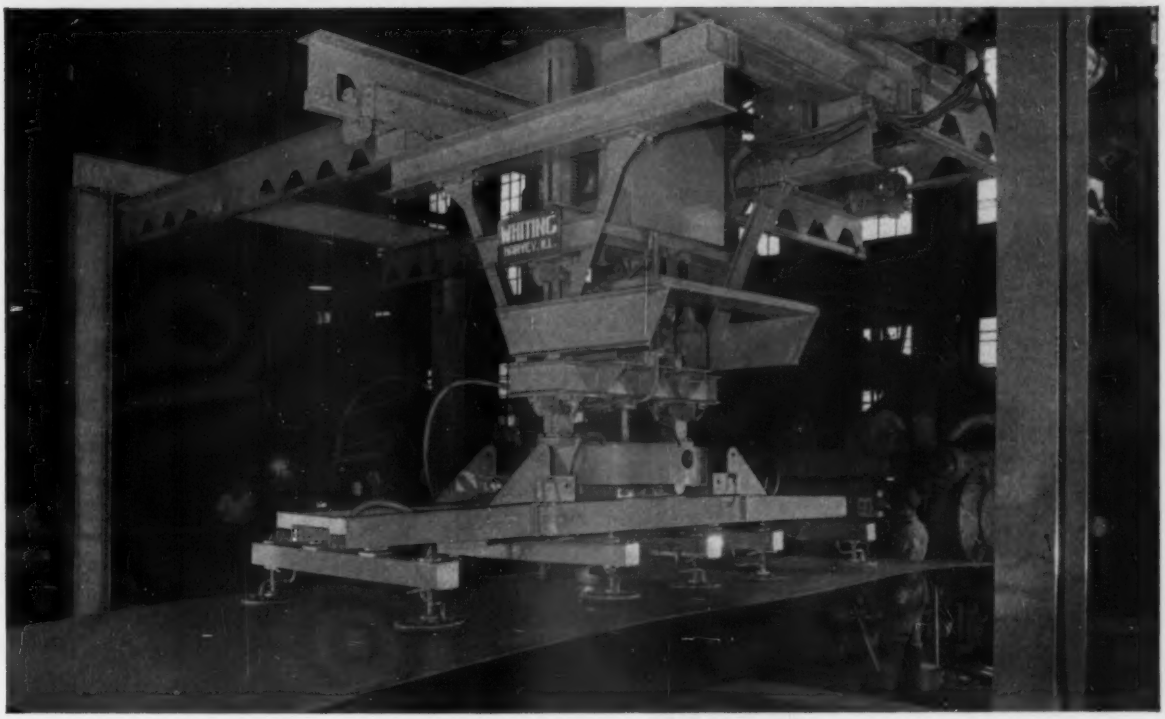

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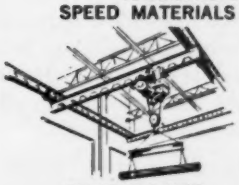
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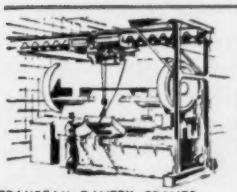
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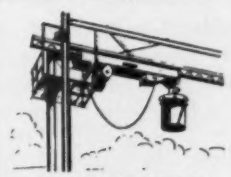
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tractors to give state engineers gratuities and gifts. He said the gifts ranged from $25 to $50 in cash, to bottles of whisky, turkeys, hams, and free dinners.

Walter C. Little, who is a $12,000 a year construction superintendent for Cone Brothers, testified he did not know anything about payments to personnel of the Florida Road Department. However, he said it had been a long-time practice to provide gifts to city, county, and state highway engineers.

J. T. Cone, Jr., president of Cone Brothers Contracting Company, readily acknowledged authorizing the $25 a week payoffs to the engineers. He insisted that the gratuities were designed to "expedite" the company's projects, and that the engineers who accepted the money were not influenced by it. "They would never let us get away with inferior work."

The president of the company further testified that the practice of contractors providing gifts to state officials has been in existence for as long as he could remember. Cone said he saw no difference between giving an engineer a couple of fifths of whisky at intervals or giving him weekly $25 payments. He testified that in 1958 his company spent more than $10,000 to buy whisky for engineers in Florida, and from 1957 to 1960 dispersed more than $23,000 in $25 payments.

Testimony also showed that Cone Brothers had received more than $30 million in road contracts in Florida since 1956. A substantial portion of the total contracts involved Interstate Highways.

Representative Gordon Scherer, Republican of Ohio, a member of the Committee, said the disclosures brought out in testimony in Florida, and elsewhere, are disgraceful. He maintains that the tactics used in Florida, and perhaps a number of other states, provide ammunition for the forces who are opposed to continuing the highway construction program in this country at the present accelerated level. He said "reprehensible actions" could have an adverse effect on the program.

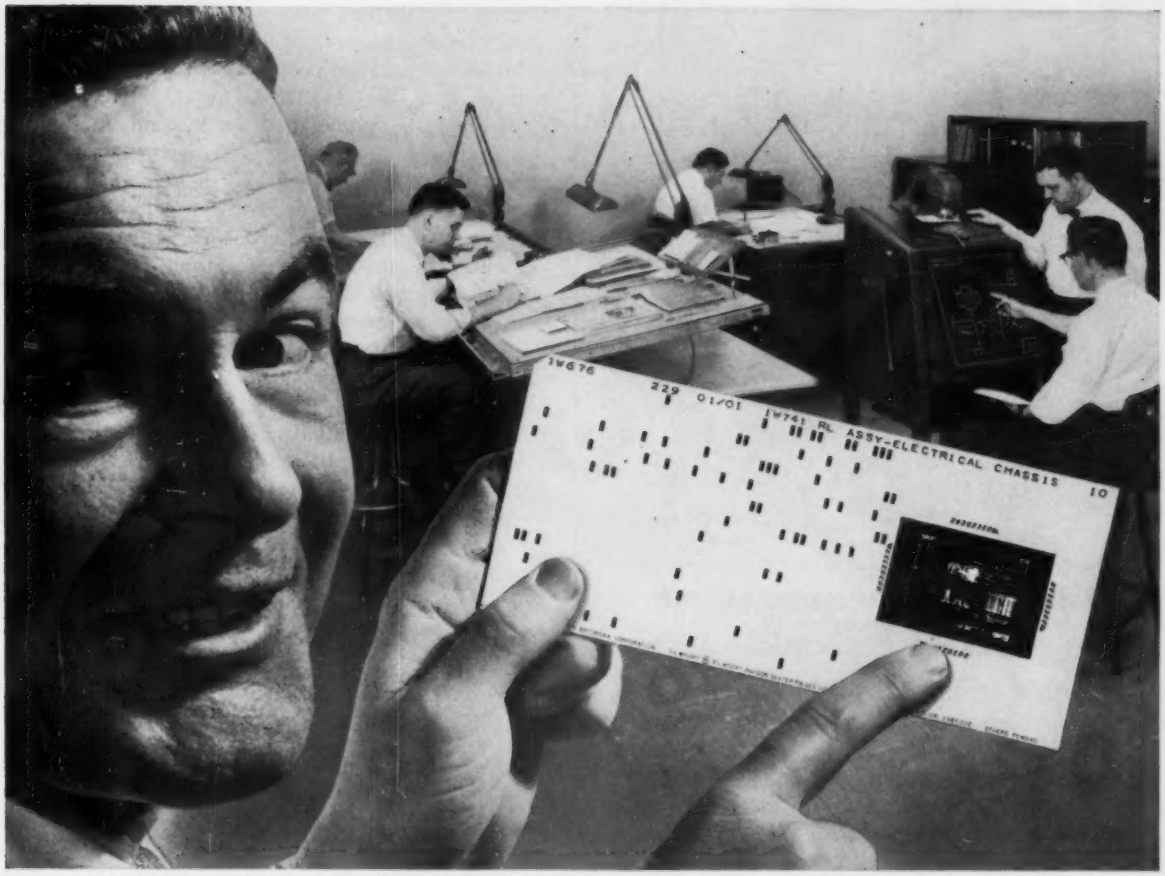
Highway Growth Projected

H. E. Humphreys, Jr., chairman of the United States Rubber Company and chairman of the National Highway Users Conference, predicts that by the end of 1961 there will be about 15,000 miles of the 41,000-mile Interstate Highway System open to traffic. This will compare with 10,000 miles at the present time.

"We will have in 1961," said Humphreys, "some 76 million motor vehicles and 91 million drivers traveling 730 billion vehicle miles."

New Construction to Rise

A forecast by the Department of Commerce's Business and Defense Administration states that new construction expenditures in 1961 are expected to reach $57.3 billion, a 4 percent increase over 1960. Although this would be a record dollar volume, the Department of



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Commerce's division predicted that physical volume would be about 2 percent lower than in 1959.

Private construction in 1961 is expected to rise 3 percent, exceeding $40 billion for the first time. This is predicted in spite of the fact that private housing starts (private construction's largest category) are expected to amount to only 1.3 million, eight percent less than 1959. Public construction should reach the $17 billion mark for the first time, an increase of 5 percent. The monetary figures will reflect the increased emphasis on school, highway, and Federal office building construction.

Highway construction is expected to be about $300 million higher in 1961 than in 1960, matching the $6 billion record chalked up in 1959. Construction costs may be higher in 1961 than in the past two years.

Construction spending in 1960 totaled $55 billion, a 2 percent decline from 1959. This is the first drop since World War II, the Commerce Department said. Primary cause of the decline was a slide of $2.4 billion in private home building. This and other decreases more than offset an increase of $1.1 billion in nonresidential construction.

Space Age Budget

Although the space age is little more than three years old, congressional experts now say that there is every indication that some $4 billion will be spent for research and development in the space field during the next two or three years. Members of the science and astronautics committees predict that more and more funds are going to be earmarked in the budget of the Department of Defense for space research. This is vital, they point out, if we expect to overtake Russia.

The National Aeronautics and Space Act, which Congress wrote into the statute books in 1958, calls for an all-out exploration of our solar system.

More Hydropower for Norway

A $25 million loan to Norway to help finance the Tokke hydroelectric development plan has been made by the World Bank. The largest hydroelectric power project ever undertaken in Norway, the Tokke plans will include three power plants having a combined capacity of 810,000 kilowatts. Transmission lines will be built to connect networks serving southern and western Norway and to export power to Sweden.

Ten United States banks are participating in the loan to the extent of $1,231,000, without the World Bank's guarantee. In 1956 a $25 million loan was made by the Bank to aid in financing the first stage of the Tokke scheme. This part of the project will begin operation in June of this year.

In the past 10 years the installed capacity of Norwegian power plants, both public and private, has nearly doubled. It is now more than 6 million kilowatts and will be 8 million kilowatts by 1965. ▲▲

The Legal Aspect

DR. MELVIN NORD
Registered Engineer
Attorney at Law

Liability to Third Persons

Tort Liability

A SUPPLIER of goods is not, in general, liable for breach of warranty to persons who are injured as a result of his supplying defective goods, unless there is privity of contract. It may not even occur to an injured third party to sue the supplier in tort for negligence, since he never has had any dealings or direct relationships with the supplier. If he should sue the supplier, it may be argued that there was no duty owed him by the supplier, so there can be no liability. This argument is predicated on the idea that the supplier has no duty to anyone with relation to the goods supplied, except such as he has assumed by the contract or sale, and the contract duty by hypothesis does not run to the benefit of the plaintiff. In short, the supplier's argument is that, without the contract or sale, he has no duty at all; if the contract is introduced, the defense is that it does not run to the plaintiff's benefit.

This argument has such an appearance of plausibility that it fooled courts for quite a long time. However, it was settled once and for all in the famous decision by Judge Cardozo, in the case of McPherson v. Buick Motor Company, which held that the manufacturer of an automobile having a defective wheel was liable to a third person injured by it. The defense argued that the supplier has no liability except on account of the existence of the contract. Actually, this is absolutely incorrect. Suppose, for example, that the manufacturer of a defective automobile should give it to someone as a gift, and the automobile similarly injures a third person. This is clearly a question of tort law, as there is no contract at all. Whether or not the manufacturer is liable for negligence will depend simply on whether or not he has been negligent. The fact that a contract may or may not exist with Mr. A. cannot detract from any tort liability to Mr. B.

It is now fully recognized that privity of contract is by no means necessary to establish tort liability. What is necessary is that the action meets the test of the four elements of liability in negligence:

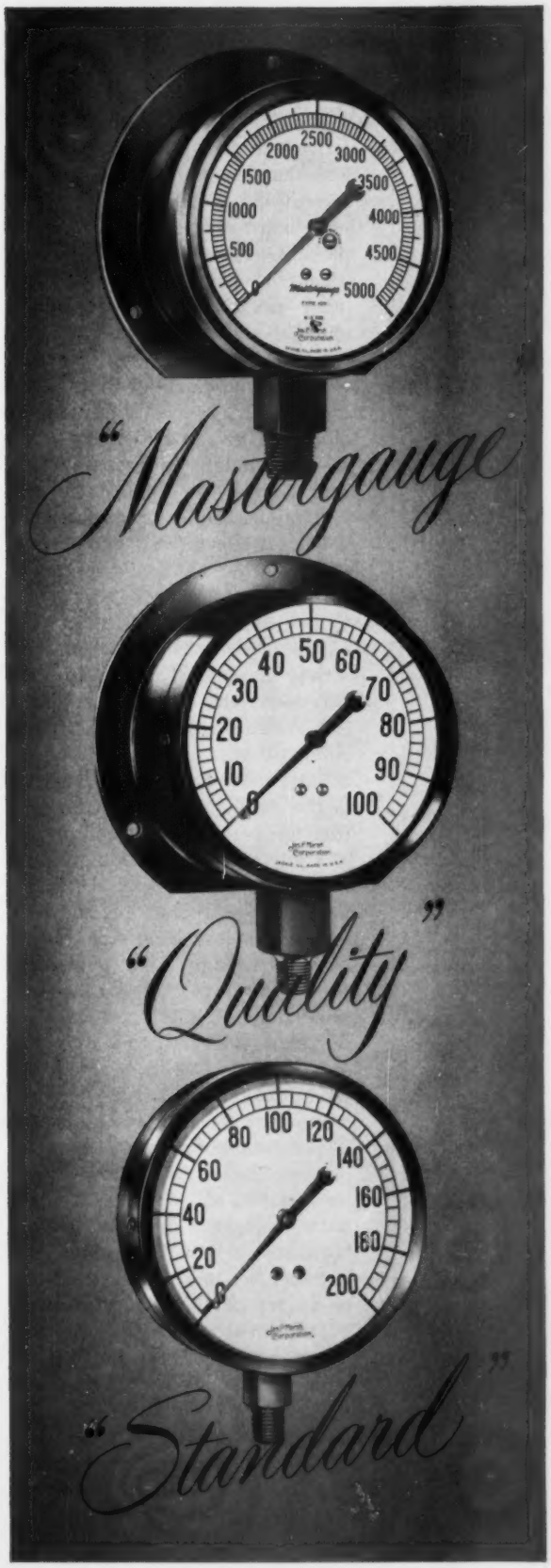
¶ There is a legal duty of care by defendant to plaintiff, arising by operation of law.

¶ There has been a failure to live up to the standard of care of a reasonable man, thereby breaching the aforesaid duty.

¶ This breach of duty is the proximate cause of the plaintiff's injury.

¶ There is substantial damage (rather than nominal damage).

Two of these elements, legal duty and proximate cause, raise special



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problems in third party liability negligence cases.

Legal Duty

If there is no special status or relationship between the plaintiff and the defendant, there can be no duty on the defendant to provide affirmative benefits for the plaintiff. Thus, there can be no liability for nonfeasance. On the other hand, once the defendant affirmatively acts (as he does, for example, by letting loose on the world an automobile with a defective wheel), he has a legal duty of care if he can reasonably foresee that failure to exercise such care is likely to injure someone. He can be liable for misfeasance if he acts affirmatively without exercising reasonable care.

In some instances, moreover, though the defendant has not acted affirmatively, the law imposes a duty of affirmative care on him, because of the existence of a special relationship (e.g., parent-child). This is true also if A owes a legal duty of care to members of the public at large, or to some class of persons. For example, if A is the owner of a building which requires repairs in order to protect the public, or to protect employees, and he employs B as architect or engineer to supervise the repairs, B now owes to said persons the same duty of affirmative care as A. Although B's duty to A arose out of B's contract with A, the contract relationship and A's pre-existing duty to said persons create a special relationship of B to these persons. The duty owed them arises by operation of law, rather than by B's agreement with them. B may be liable not only for misfeasance, but even for nonfeasance, because he has an affirmative duty of care.

The extent of this duty, insofar as nonfeasance is concerned, is the same as that owed by the owner, A. Insofar as misfeasance is concerned, the duty issue boils down to whether the defendant could reasonably foresee injury to others

if he acted without due care. Obviously, in many third party cases, the answer is "no;" but, as pointed out by McPherson v. Buick, in some cases the answer is "yes," despite lack of privity.

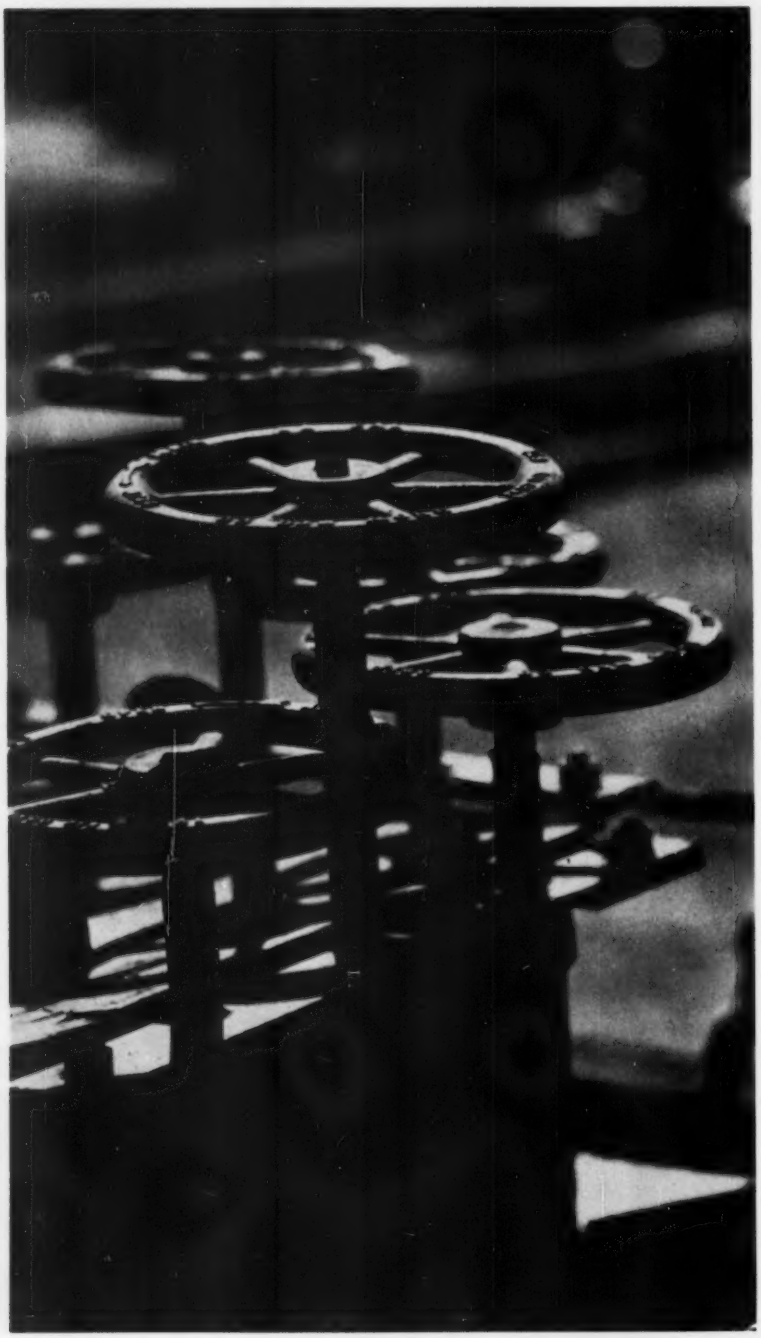
In another Cardozo case, (Palsgraf v. Long Island R. Co.) a similar question arose. Is it indispensable that it be foreseeable that the injury will occur to the plaintiff, rather than to some person otherwise situated? Theoretically, it would seem that the answer to this question must be "yes," since the legal duty must be owed to the plaintiff; that is the way Cardozo answered the question. Under this view, there is clearly a way of limiting the spread of third party liability, by holding in particular cases that the plaintiff is an unforeseeable plaintiff.

Not all courts, however, follow this rule of unforeseeable plaintiffs. In the view of other courts, if it is reasonable to foresee that the activity may menace Mr. A, it is irrelevant whether it is Mr. B, who in fact is injured. In either event, there is liability in negligence, provided there is proximate causation. Under this theory, the likelihood of the activity causing injury creates a legal duty which is owed to everyone.

Actually, there is less difference between the two views than at first appears, since under either view the liability extends to the entire group of persons who may be injured in the foreseeable way. The difference pertains to persons who are injured in an unforeseeable way. Under the Palsgraf rule, there is no liability to them. Under the rule in other states, whether or not there is liability to them depends on whether or not there is proximate cause, since proximate cause is not determined solely by the foreseeability of injury.

Proximate Cause

In determining whether a particular cause of an injury shall be regarded as the legal cause, or proxi-



mate cause, the method of analysis is as follows: (1) if the particular cause is not a cause in fact or *sine qua non* of the injury, it cannot be the proximate cause; (2) if the particular cause is a cause in fact, it is automatically a proximate cause, unless there exists also another cause in fact which is independent, intervening, and unforeseeable. For example, suppose driver D negligently hits pedestrian P and leaves him injured in the road. Shortly thereafter, P's enemy X comes along, and seeing P in the road, shoots him in the leg. Clearly, D is not liable for this leg injury to P. D's driving was a cause in fact of the shooting, since otherwise P would not have been at the spot where X shot him, but X's shooting was independent (not itself caused by D's act, nor made effective by D's act), intervening (coming into effect subsequently to D's act), and unforeseeable. Therefore, D's act was not the proximate cause of P's gunshot wound.

On the other hand, a cause in fact could lead to an unforeseeable injury, in which a second cause plays a part. Yet the first cause may be a proximate cause if the second cause is dependent or non-intervening. So, foreseeability is a factor in proximate causation, but not the sole factor. To determine legal duty in misfeasance cases, foreseeability is the sole criterion.

Liability of Suppliers of Services

Thus, the analytical conditions for liability in negligence of a supplier of services, such as an architect or engineer, can be summarized as follows:

¶ There must be a legal duty of care owing the plaintiff by the defendant, which duty arises by operation of law. This may exist in one of two ways: (a) the parties are in some special relationship or status such that the law places an affirmative duty of care on the defendant for the benefit of the plaintiff, even though the defend-

ant never actively engages in affirmative acts – in which case there may be liability for either misfeasance or nonfeasance; (b) the defendant engages in affirmative acts and it is reasonably foreseeable that if he fails to exercise due care, it is likely that someone may be injured (under the Palsgraf rule, it must be reasonably foreseeable that someone in the position of the plaintiff may be injured) – in which case there may be liability for misfeasance, but there cannot be liability for nonfeasance.

¶ There must be a breach of legal duty – failure to exercise the standard of care of a reasonable person under the circumstances.

¶ Defendant's conduct must be the proximate cause of plaintiff's injury, i.e., it must be: (a) a cause in fact or *sine qua non* of the injury, and (b) there must be no other independent, intervening, unforeseeable cause in fact to break the chain of proximate causation.

¶ Plaintiff must suffer substantial damage as a result of defendant's conduct.

Thus, privity of contract has no bearing on the question of tort liability to third persons. While persons in privity of contract are clearly included within the class of foreseeable plaintiffs in misfeasance cases, they by no means exhaust the class. Furthermore, there are some cases of liability for nonfeasance on account of special relationships. In these cases, if there is privity of contract, the liability is purely contractual and is not in tort. If, on the other hand, there is no privity of contract, the liability is in tort.

It can be predicted safely that, in the future, privity of contract will be relegated to the shelf, insofar as the liability of architects and engineers to third parties is concerned. There are limitations on how far this liability can spread, but they are not to be found in the privity concept, but rather in the concepts of legal duty of care and proximate cause. ▲▲

MARJORIE ODEN
Eastern Editor

Secretaries for Engineers

Field Notes

ENGINEERS have long wished for secretaries as professionally competent as medical or legal secretaries. Now, a school for training engineering secretaries finds that the demand for its graduates far exceeds the supply. Started five years ago in Pittsburgh at the suggestion of local engineers, the engineering secretarial school has progressed to the point where it has been awarded a junior college charter, and negotiations are being conducted to franchise similar courses throughout the nation.

Dr. Dorothy C. Finkelhor, president of Point Park Junior College (known as Business Training College in pre-charter days) explained: "It is the purpose of this course to provide young women with the type of training that will enable them to be of greater assistance to the engineer. Our graduates not only will understand technical engineering terms, they will be able to spell them."

Potential engineering secretaries, upon application to Point Park, are given aptitude tests. Admission is based on results of these tests, on high school grades, and on requisite high school math and English courses. About 10 percent of the students are men.

The Curriculum

During the two-year program, the secretaries study the usual secretarial courses – typing and dictation (typing is learned from specifications, and dictation from the secretary's nightmare, Civil Aeronautics Board reports), shorthand, English, spelling, mathematics, filing, record keeping, and "vari-type" application. In addition, they are taught terminology in civil, mechanical, electrical, chemical, metallurgical, industrial, and aeronautical engineering. "Emphasis is placed on mechanical and electrical engineering, since these terms seem to occur most frequently in other engineering specialties," school officials explained. Special engineering shorthand also is taught from textbooks prepared and trademarked by Point Park teachers.

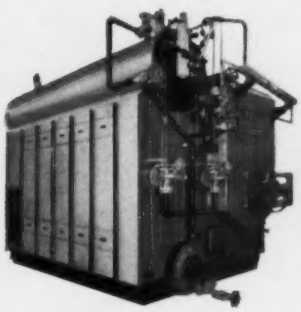
Lab courses are taught in chemistry and physics. "The students learn metallurgical terms much faster if they have actually extracted a metal from its ore in the lab." There are also basic courses in slide rule calculations, drafting, engineering literature, and Russian. The latter is optional, but includes translation of professional, scientific, and engineering articles.

Upon becoming a junior college, Point Park added courses in physical education and the arts and sciences. It always had included courses in psychology and personality development.

After completing the two-year course (1200 lecture hours), the engineering secretaries are required to write a thesis. The topics have

if...

you will <u>compare</u>, you will select...



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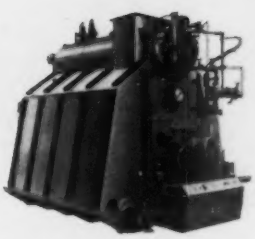

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included "The Story of the Pennsylvania Turnpike," "The World of Steel," and "The Study of the Atom." Upon approval of the thesis, an associate degree is granted in arts or science. Eventually, Point Park hopes to become a four-year college granting full degrees.

Problems and Progress

George Butterly, Point Park public relations director, explained that the school has had its problems. With the announcement of the first graduating class (of only three students) in 1957, the school was swamped with requests for engineering secretaries. They included offers from Australia, Japan, and Europe. "But the students were from the Pittsburgh area, and they did not seem to want to leave home." Butterly hopes that with the change to junior college status students will come from other areas, and the school will be able to fill requests for graduates from other parts of the U. S. and abroad.

The engineering secretarial course is not cheap. The two-year course costs about $2000 and, as a result, students frequently hold down part-time jobs in addition to attending school. However, the investment yields immediate returns. Engineering secretaries get starting salaries of $400 to $500 a month, compared to about $300 for graduates of regular secretarial schools.

Historical Background

Dr. Finkelhor began Business Training College as one of the first specialized schools for medical secretaries. The school opened on the first day of the "Bank Holiday" in 1933. After considerable research into what doctors wanted in the way of secretarial help, a course was devised combining academic subjects, secretarial training, and laboratory work.

In about 1952, Dr. Finkelhor began investigating the need for engineering secretaries. Finding a market, she began a study of the special secretarial requirements of engineers in various fields.

Deciding to go ahead with the engineering secretarial program, the next task was the preparation of textbooks. In 1955, the first freshman class of three was accepted. In June 1960, the school graduated 70 "tech secs."

The program has gained nationwide attention. Pentagon officials have inquired into the possibilities of making a similar training program available in Washington, and the Air Force is considering sending some of its civilian personnel to Pittsburgh for condensed courses.

With Point Park's charter came the end of an era. The more dignified position of being a nonprofit educational institution meant more dignified advertising. One of the schools former ads probably was responsible for the remarkable number of girls applying for admission. The ad stated: "Your first job will be working and traveling with a top engineering executive."

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CARL H. RISTAU, C.P.A.

NET WORTH is, broadly speaking, the excess of business assets over liabilities. It is shown in the conventional balance sheet in a section labeled "net worth," and represents the book value of assets over liabilities. On a corporation's statement, net worth is capital stock plus surpluses less deficit. On a sole proprietorship or partnership statement, it is the investment of the owner or partners plus earnings left in the business less deficits or excess drawings.

Net worth should never be regarded as the amount which would be distributable to the owners upon immediate disposal of the assets and payment of the liabilities. Neither does it reflect the exact amount at which such a business could be sold outright.

Firms who maintain their books on a cash basis will find the book net worth to be more inaccurate than those who employ the accrual method. Book value of assets does not necessarily equal actual value or even estimated realizable values, hence the disparity between net worth on the books and the actual worth of the going concern.

To determine net worth accurately, each item on the balance sheet must be evaluated or appraised for its individual worth.

¶ Cash requires no revaluation.

¶ Accounts receivable must be reviewed, and uncollectable or highly doubtful accounts or amounts should be eliminated.

¶ Work in progress should be stated in terms of billable and collectable amounts.

¶ Fixed assets, including land and building, should be appraised.

Those who employ the cash basis method of accounting should make this same evaluation, reducing the total by their liabilities.

Good will is such a nebulous item in a professional operation that it is questionable what, if any, consideration should be given it. The successful practitioner, in valuing his business, may rightfully feel that as a going concern, he is entitled to add something for good will. If this intangible something is so personal that without the owner's presence it is lost, no value should be attached to it. The more a firm operates as an establishment whose services are sought because of the reputation of the organization rather than that of one individual, the more good will takes on an aspect of value.

Good accounting practice, however, frowns upon reflecting any good will not actually purchased. Its place is in evaluation for purpose of sale, and it never should be added to a financial statement without a change in ownership. ▲▲

The Readers' Guide

Survey of the Profession
page 110

". . . private business is the largest single client of consulting firms . . . 44.7 percent of engineering work came from private business last year." Following last month's description of the growth of the profession through the fifties, CONSULTING ENGINEER this month studies the present status of U. S. consulting firms.

Comparison of Dams
page 82

"The most useful purpose of a comparative study of dams should be to make the reviewer aware of the relative significance of each project." G. S. Sarkaria, of International Engineering Company, suggests that dams should not be judged solely by size. He develops the concept of a dam comparison number based on the inclusion of as many design and construction factors as possible.

Analytical Services
page 91

"Perhaps in no other field of practice is the engineer so morally obligated to render service to the full extent of his understanding with the client." Arthur F. Weers, of Arrowhead Engineers, Incorporated, points out the importance of complete and accurate engineering analyses for both new and existing buildings.

Capitol Expansion
page 96

"Since the [present Capitol] was built over a long period of years, the building today is a monument to the evolution of construction practices." A detailed report presents the approach and solutions to the unique problems encountered by the architects and engineers who planned and carried out the Capitol expansion plan, extending the East facade of the building more than 30 feet.

Early Hydraulics
page 104

"Belidor's book reflects the increasing efforts to replace earlier empirical practices by more accurate, quantitative methods in engineering design." James Kip Finch, Dean Emeritus of the Columbia School of Engineering, continues his historical series with an article on the 18th century French engineer, Bernard Belidor.

Exotic Sealants
page 115

"While the new sealants . . . offer advantages, there has been a tendency . . . to play down their limitations." Robert Lang, of Lockwood Greene, discusses the application of "exotic" sealants.

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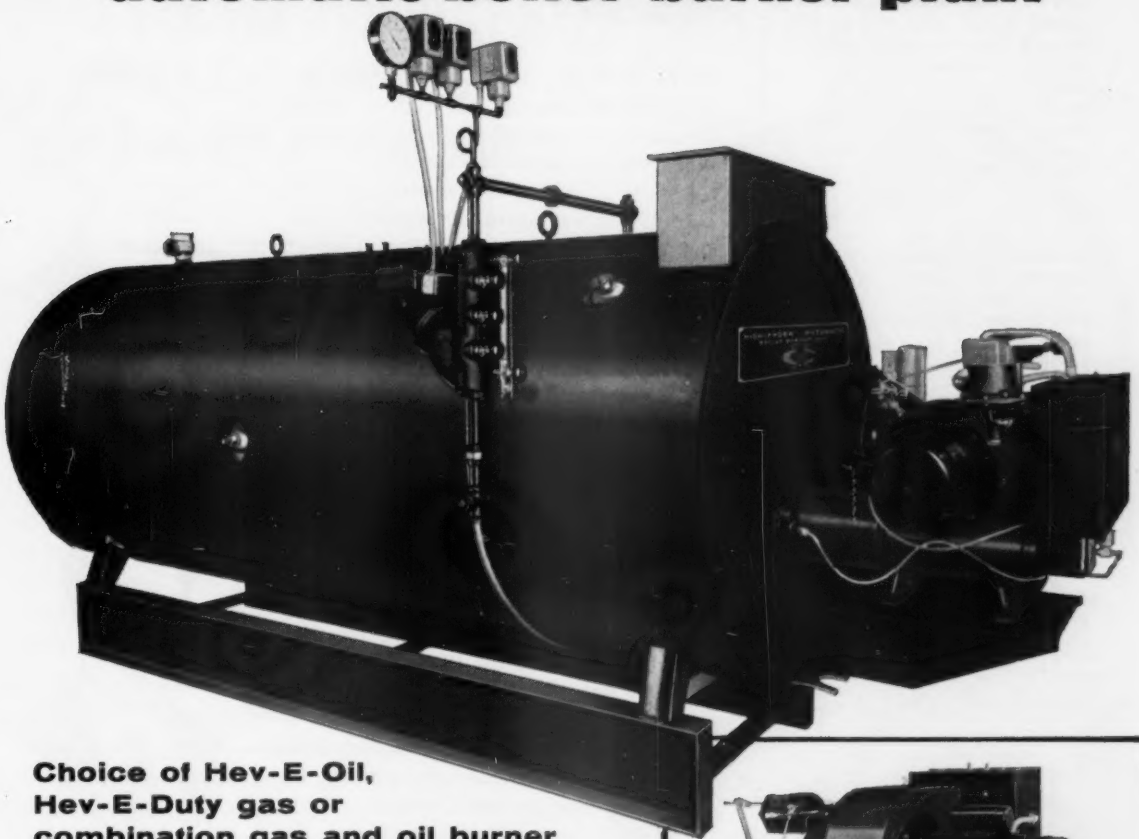

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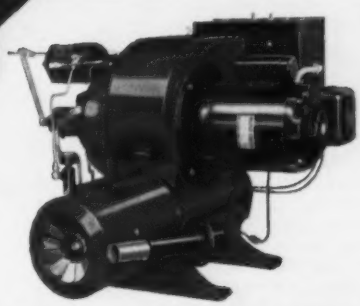

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Our Authors

Arthur F. Weers, owner of A. F. Weers and Company, of Denver, was born in Peoria, Illinois. He began his engineering education at the University of Illinois, and earned a B. S. in E. E. at the University of Colorado. Weers was one of the pioneer consultants in the Rocky Mountain area, opening a Denver office in 1948. His firm specializes in electrical work, and has completed projects for Federal and local governments, public utilities, and industry. He is a member of NSPE and CEC. His article on electrical surveys begins on page 91.

G. S. Sarkaria graduated from Punjab Engineering College, in his native India, at the end of World War II. After graduate work leading to Master's degrees from Harvard and Brooklyn Polytech, he returned to India to work on the Bhakra Dam project. Five years later he came to the U. S. Bureau of Reclamation, working chiefly on the structural analysis of concrete dams. Since 1956, Sarkaria has been with the International Engineering Company, supervising work in Brazil and California. His article on dam comparisons is on page 83.

Richard Lang, a native of New Jersey, graduated from the Stevens Institute of Technology. He then served a tour of duty in the U. S. Navy as an officer in the South Pacific. After the war, he was employed by the Worthington Company, working in their development laboratory. Following this, Lang designed textile mills for export to the Middle and Far East. In 1951 he joined Lockwood Greene Engineers, where he is now a project engineer. His article, on the problems involved in the use of the new exotic sealants, begins on page 115.

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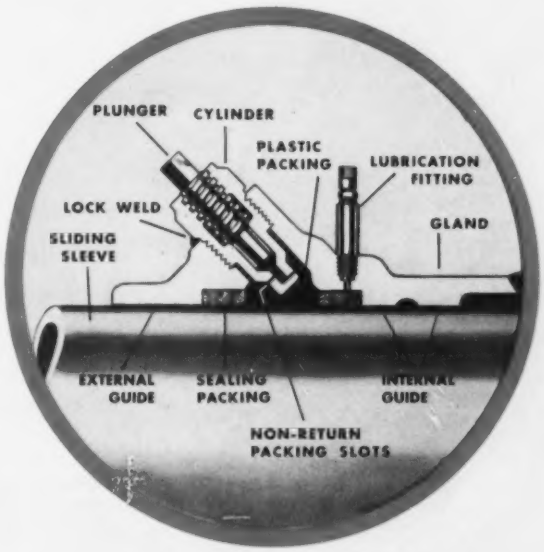

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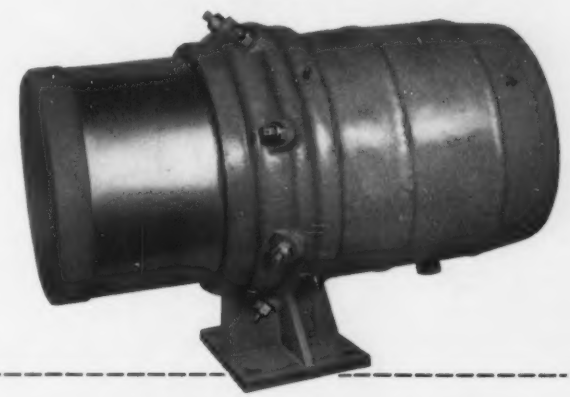

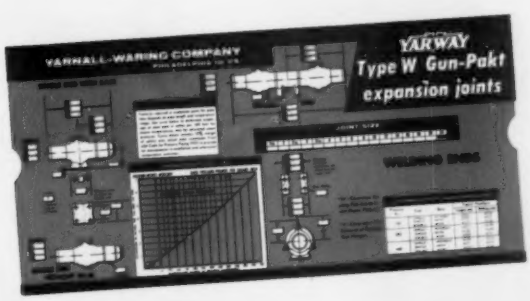

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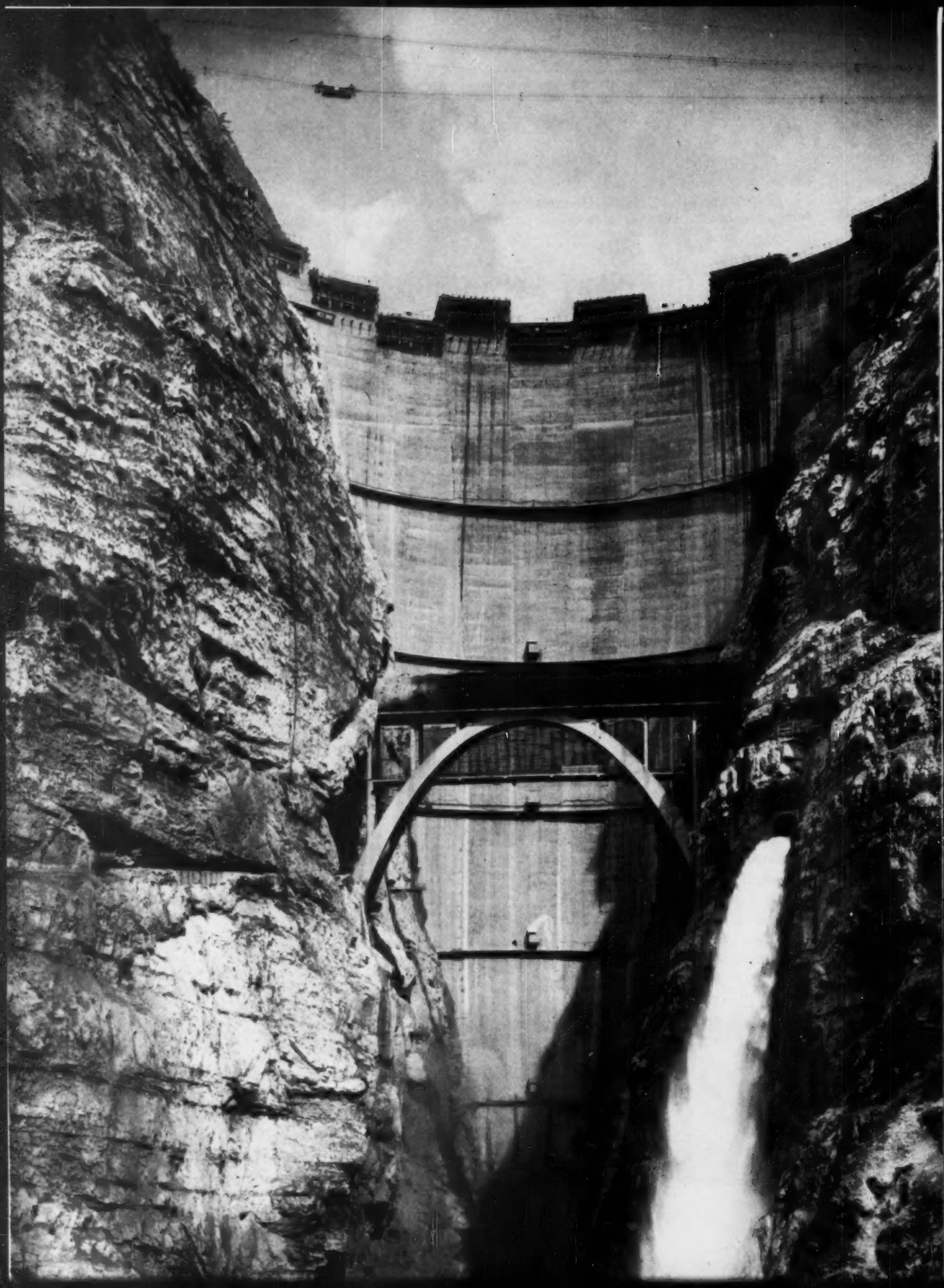

Large Dams...

Their Engineering Significance

G. S. SARKARIA
International Engineering Co.

DAMS ARE AMONG the most magnificent of man made structures. They lure the engineer into seeking out spectacular statistics which he sometimes uses in irrelevant comparisons. But comparative analysis plays an important role in the engineering of dams, for it can help the designer to improve his work by taking advantage of the experience of others in the field. However, it is difficult to develop standards of comparison, for all dams are not alike, even those classified as being of the same type.

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What Should Be Compared

Many factors contribute to the importance of a dam. While a few have limited applicability, most of the following are common to all types of dams: structural height, volume, shape of dam site, nature of foundations, seismic activity in the area, volume of reservoir, capacity of powerhouse, spillway capacity, value of vulnerable property downstream of dam, area irrigated, age of dam, quality of materials and workmanship, and construction methods.

In a concrete gravity dam it is desirable to know if the dam is designed and built as a cantilever, a three-dimensional monolith, or a hinged structure. Size of the largest blocks, provision for longitudinal and transverse contraction joints, procedures for temperature control of concrete, and foundation drainage and grouting arrangements are important features of such a dam. From the designer's viewpoint, data on stresses, uplift pressures, and allowable stability factors also should be incorporated into the comparison of gravity dams, for they greatly influence a dam's final form.

Comparison of arch dams would require, in addition to most of the items applicable to gravity dams, the inclusion of others such as shape of dam, radii, central angles, temperature stresses, treatment of radial contraction joints, allowable tension, and even the methods of stress analysis.

Embankment type dams are subject to problems of design and construction which are of less importance in concrete dams. These include control of seepage through and under the dam, settlement, materials, and methods of consolidation and construction.

Because of these many variable factors, comparisons should not be restricted to one or two items. The more extensive the better, and the more factors that are reviewed, the more useful the comparison will be to the engineering of future dams.

Typical Dam Comparisons

Building a large dam is a challenge anywhere, but it can be many times more difficult if the site is not easily accessible, or if materials have to be transported long distances over rough terrain. Grande Dixence Dam in the Swiss Alps is being built at an altitude of 7700 feet. Because of heavy snowfall and danger of avalanches, construction stops for seven months out of the year. This adds to the importance of the structure, marking its construction planning as an achievement of special merit.

Shape of dam site is significant to both the designer and the builder. An example is the arch dam, where a design as structurally slender as possible is the aim of the engineer. The extent to which the designer can economize on the section depends on the shape and narrowness of the site. Fig. 1 compares the canyon shapes of the sites of six arch dams, including some of the world's highest. These are profiles developed along the center line of the dam. A glance at this figure is enough to impress an engineer with the diversity in shape at the various sites. A canyon shape factor (CSF), defined as the ratio of the abutment and foundation perimeter to the maximum height of the dam, is used to express the shape of a dam site with a numerical term which can be used in making dam comparisons. The larger the canyon shape factor, the wider is the canyon and the thicker would be the section of an arch dam, pro-

Recently completed Vaiont Dam in Italy, shown on the opposite page, is presently the highest arch dam in the world.

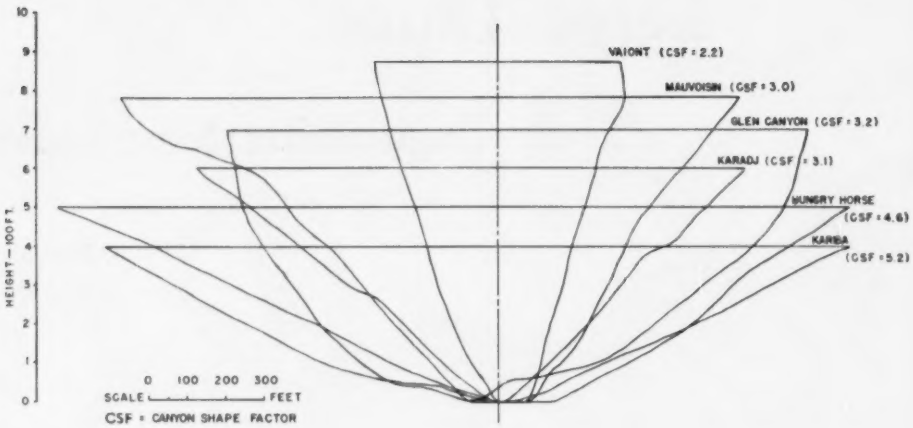


Fig. 1 – Canyon shapes of major arch dams. CSF represents ratio of abutment and foundation perimeter to maximum height.

vided design criteria and methods are identical. Canyon shape factors for arch dams are given in Fig. 1.

To illustrate the point further, consider the recently completed Vaiont Dam in Italy and the Kariba Dam in Rhodesia. The former – presently the highest dam in the world – is located in a very narrow U-shaped canyon. Kariba is located in such a wide canyon that until only a few years ago it would have been considered economically unsuitable for an arch dam. Vaiont Dam would be considered an achievement twice as great as Kariba in terms of height alone, yet the latter is almost three times as daring an accomplishment because of its wide canyon. Crown cantilever sections of various arch dams are shown in Fig. 2. The divergence in their shapes and dimensions is very great, but to visualize fully the comparable size of these dams, Figs. 1 and 2 should be compared together with the data in Table 1.

Influence of Foundations

The nature of foundation materials and the extent of treatment required often decide what type and

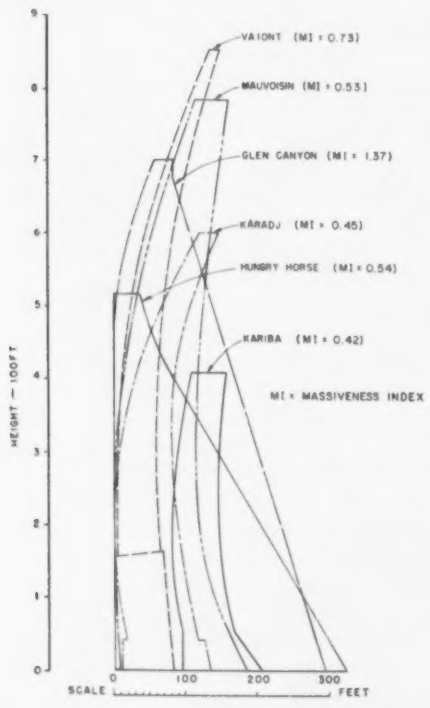


Fig. 2 – Crown cantilever sections of major arch dams.

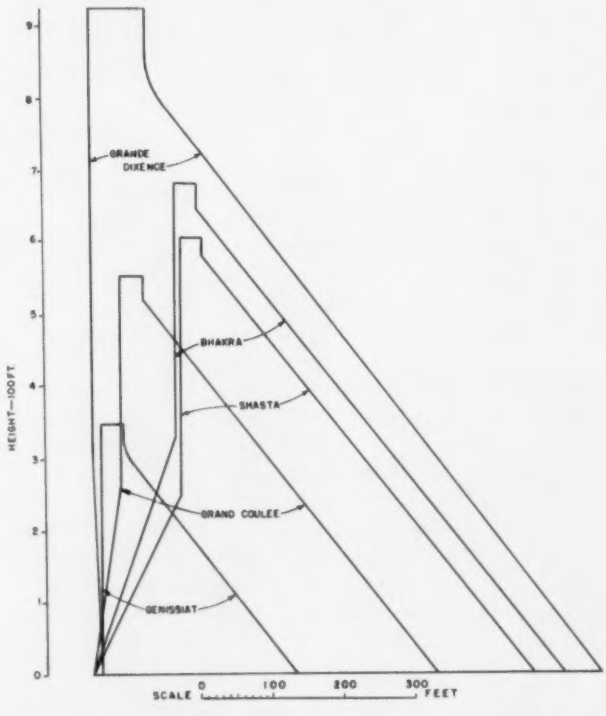


Fig. 3 – Cross sections and heights of major gravity dams.

TABLE I—COMPARATIVE DATA FOR MAJOR DAMS

	Year of Completion	H Max. Height ft.	V_d Volume of Dam cu. yd.	V_r Max. Reservoir Capacity acre-ft.	P Power Capacity (ultimate) MW	Q Max. Spillway Capacity c.f.s.	Foundation	Seismic Design	Dam Comparison Number
Gravity Dams									
Bhakra, India	1961	680	5,120,000	7,400,000	900	290,000	Sandstone	yes	5.9
Genissiat, France	1948	345	875,000	42,910	390	161,000	Limestone		3 6
Grand Coulee, USA	1942	550	10,493,000	9,517,000	1974	1,000,000	Granite	yes	7.4
Grande Dixence, Switzerland	1966	922	7,540,000	32,400	835	0	Granite	yes	5 5
Hoover, USA*	1936	726	3,250,000	30,500,000	1332	400,000	Andesite Breccia		7.1
Shasta, USA	1945	602	6,230,000	4,390,000	360	185,000	Meta Andesite	yes	5.2
Arch Dams									
Glen Canyon, USA	1965	700	4,770,000	28,000,000	900	276,000	Sandstone	yes	6.5
Hungry Horse, USA	1953	546	3,087,000	3,500,000	285	50,000	Dolomite	yes	4.5
Karadj, Iran	1961	590	960,000	166,000	84	51,000	Diorite	yes	3.8
Kariba, Rhodesia	1960	420	1,400,000	130,000,000	1200	230,000			7.1
Mauvoisin, Switz.	1957	780	2,800,000	144,000	363		Calcareous Schist	yes	4.4
Vaiont, Italy	1960	870	470,000	125,000	229	0	Dolomite Limestone	yes	4.1
Earthfill, Rockfill & Composite Type Dams									
Brownlee, USA	1958	400	7,500,000	1,470,000	540	300,000	Basalt	no	4.4
Fort Peck, USA	1940	242	125,600,000	19,000,000	85	250,000	Shale, Sand & Gravel		4.8
Furnas, Brazil	1962	400	10,000,000	16,850,000	1100	459,000	Quartzite	no	5.3
Kuibyshev, USSR	1957	100	130,000,000**	43,500,000	2100	1,375,000	Alluvial Deposits		7.2
Oahe, USA	1960	242	91,800,000	23,600,000	637	300,000	Shale & Glacial Till		5.4
Oroville, USA	Proposed	735	80,000,000	3,523,000	1200	650,000	Amphibolite	yes	6.9
Paradela, Spain	1959	362	2,500,000	130,000	130	45,000	Weathered Granite		3.2
Swift, USA	1959	512	15,700,000	740,000	274	120,000	Gravel	no	4.4
Trinity, USA	1961	537	33,200,000	2,500,000	400	24,000	Meta Andesite	no	4 6

* Curved gravity dam; designed as an arch. ** Unconfirmed data; includes all earthwork and concrete.

size of dam is feasible at a particular site. The cost of preparing a foundation adequate for a concrete dam may be so great that a fill dam would be economical despite other factors weighing against it. Bhakra Dam in India, and Shasta Dam in California, are both monolithic gravity dams in the same height range (see Fig. 3). The Bhakra foundation consists of sound sandstone with many major soft claystone zones. At one location a 40-ft wide claystone seam was excavated to a depth of about 100-ft below the adjacent sound rock surface and backfilled with concrete. Shasta Dam is founded on andesite and also required some treatment in seams of weathered rock, but the effect of this treatment was insignificant when compared to Bhakra Dam. Thus, it is obvious that the relative difficulties involved in foundation treatment deserve consideration in any comparative dam study.

Design of earth dams also is influenced greatly by foundation conditions. The nature of cutoff provided, when the impermeable foundation is either too deep or nonexistent, and the danger of foundation failure can greatly affect the slopes, zoning, and general design of the embankment section.

If an area is seismically active, and design of the dam includes consideration of forces generated by earthquake shock, the design becomes more complicated. In concrete gravity dams, the required section of the structure becomes more massive. A gravity dam designed for 0.10 horizontal earthquake acceleration would require approximately 12 percent more concrete. Comparison of the sections of two gravity dams, therefore, would be incomplete if

Hungry Horse is an arch type dam, located on the South Fork of the Flathead River, in Montana.

proper attention were not given to the seismic criteria included in their design.

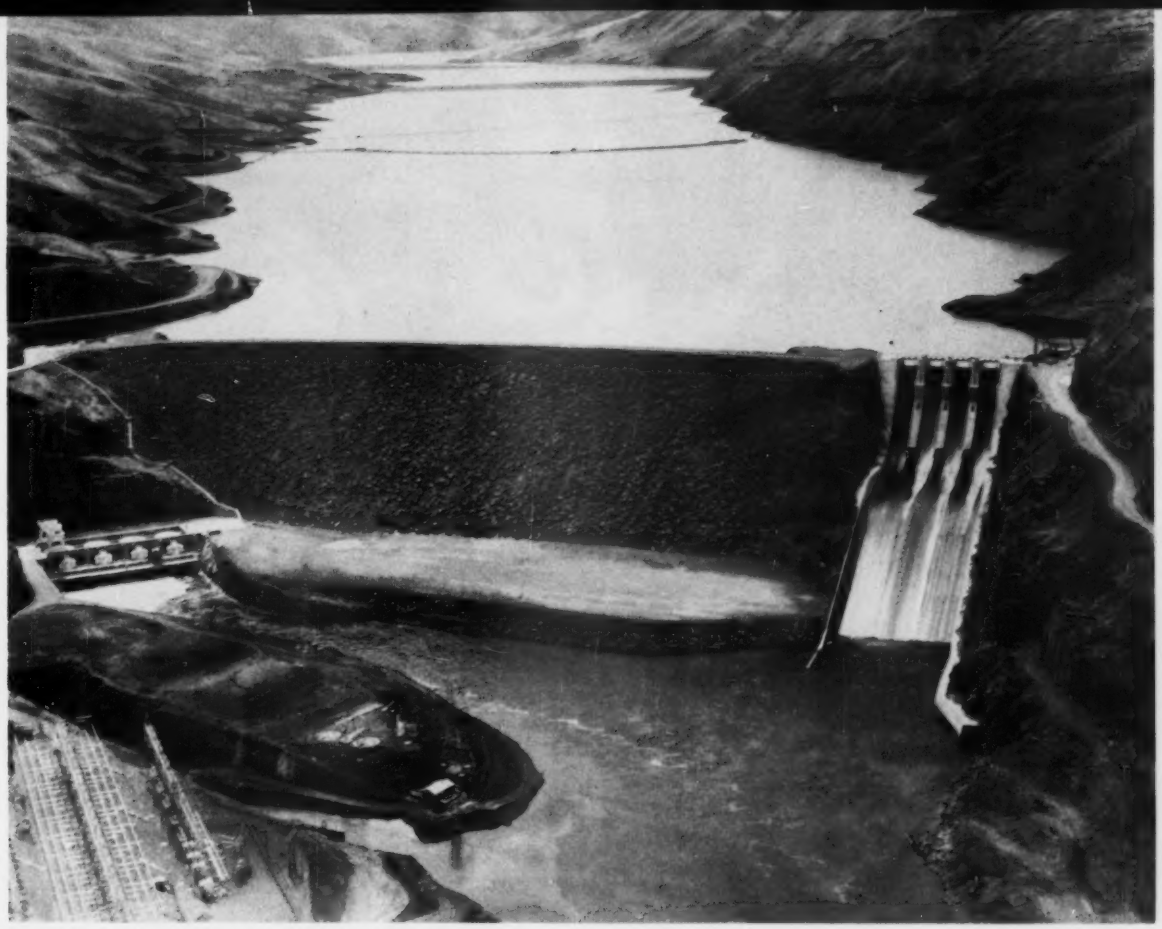
A Basis for Size Comparison

Size of a dam, as represented by its height and bulk, is the factor that is easily the most impressive to the eye. Thus, maximum height is used more often than any other physical feature to compare different dams. Although height and volume of a dam are important, the highest and largest dams are not necessarily the most important. Since definitions of maximum height vary, there is considerable scope for dispute. Admittedly, height barriers exist for all types of dams, and every engineer hopes to surpass these artificial limits. The establishment of a height or size record does not necessarily indicate important progress in this field of engineering.

The effort that goes into placing a cubic yard of concrete or earthfill can be truly appreciated only if sufficient information is available on the site location, type of equipment available, duration of working season, and competency of the construction staff. A crew of 5000 laborers taking two years to place 200,000 cubic yards of concrete using an outmoded batching and mixing plant is perhaps as significant an achievement as a million cubic yards placed by modern equipment in half the time.

For a concrete dam located at high altitudes or in countries where winter concreting is either im-

Grand Coulee Dam, on the Columbia River in Washington. Grand Coulee has the largest known power capacity in the world.



Brownlee Dam, on the Snake River between Idaho and Oregon. Brownlee is 400-ft high and built on a basalt foundation.

possible or very slow, speed of construction is perhaps even more important than the ultimate size. At Grande Dixence Dam the work season is but five months long. Under these circumstances a record rate of 8000 cubic yards a day reached on this job gains additional importance.

Comparing the volume of an earthfill dam with that of a concrete dam is the equivalent of comparing elephants with horses. As a rough approximation, an average earth dam would contain more than five times as much material as a concrete gravity dam at the same site. Depending upon width of the site, location of borrow pits, and type of equipment, fill in an earth dam can be placed at a rate five to ten times as fast as the fastest concreting rate for massive dams.

Considering only earth or rockfill dams, volume of fill still may not be a comparable item unless methods of construction and nature of materials also are kept in mind. Fort Peck Dam, with 125.6 million cubic yards in its hydraulic-fill embankment, is to date the largest earthfill dam in the world. Two other giants in the same class, the Garrison Dam (75 million cubic yards) and Oahe Dam (91.8 million cubic yards) are of rolled-fill construction. The rolled-fill dam requires a great deal of mechanical compactive effort to acheive the density required. Therefore, it would be difficult to find a true equivalent in the construction of a hydraulic fill.

Economic Significance

The stature of a dam and its adjoining works also is judged by its contribution to the economic welfare of the region in which it is located. The kilowatt-hours of energy that it can produce and the acre-feet of water it can furnish are two major indices of a dam's importance. Its capacity to absorb floods and erratic peaks in reservoir water level is another function of considerable economic value.

Energy potential of a dam site is proportional to the total usable volume of water that can be stored in the reservoir, and the hydraulic head that is made available by construction of the dam. Volume of active storage also indicates capability of the dam to supply water for irrigation or other purposes, should there be such a demand. A truly distinctive dam would thus combine great height, a large reservoir, a high installed power capacity, and a large scale irrigation or water supply system.

A large, high dam built to store only a nominal amount of water suggests a very advanced economy,

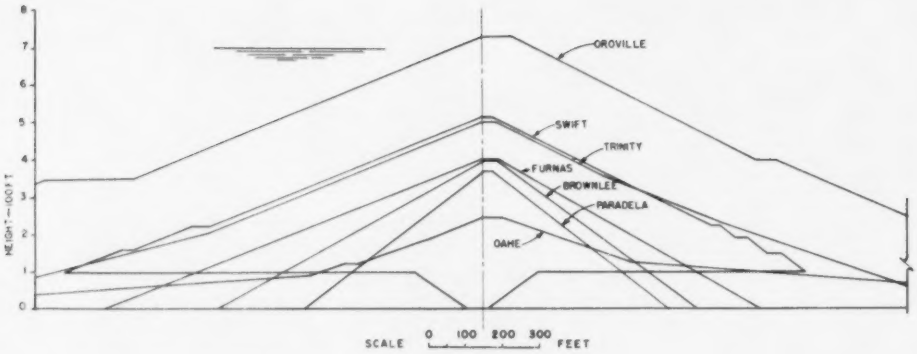


Fig. 4 — Cross-sections and heights of seven large earth or rockfill dams.

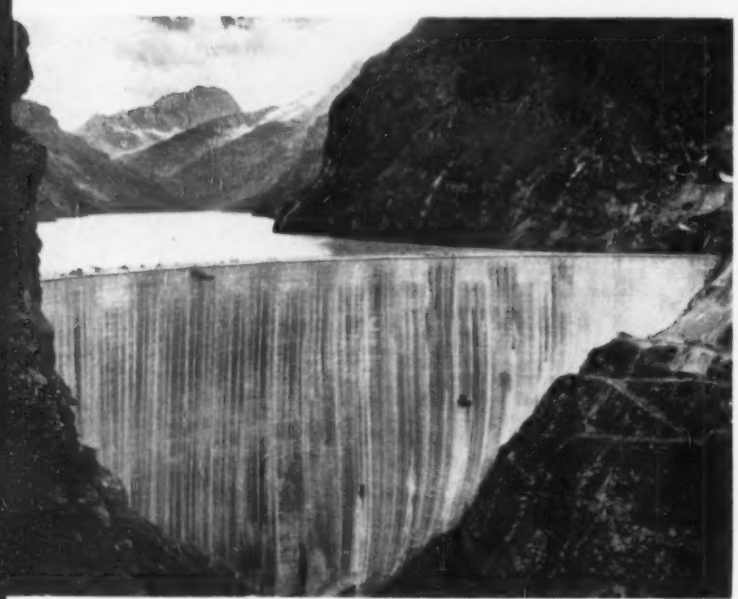
in which river resources have been exploited to the limit. Switzerland and Italy are two countries in this classification. Grande Dixence and Mauvoisin in Switzerland, and Vaiont in Italy, will be the three highest dams in the world when completed. Respectively, they have 35, 185, and 144 acre-feet of reservoir volume per foot of maximum height. Comparing these to 42,000 for Hoover in the USA, 42,200 for Furnas in Brazil, 310,000 for Kariba in Rhodesia, and an estimated 435,000 for Kuibyshev in the USSR, gives a clearer perspective on the relative economic significance of these projects.

Capacity of the powerhouse at the dam, or of all the power installations directly dependent on the dam, is also a measure of the importance of the project. Quite often a river is regulated by a chain of dams, some of which may store water for a long period while others may hold a larger volume for only short periods. The dam with the largest live-storage capacity controls, to a great degree, the capabilities of all dams and powerhouses downstream.

Grand Coulee Dam, so far the largest concrete dam in the world, is one such example. By virtue of its large reservoir and its location, it exerts a great influence on the operation of installations at Chief Joseph, Rocky Reach, Rock Island, Priest Rapids, McNary, the Dalles, and Bonneville dams, all of which are important structures in their own right. What is more, future dams such as Wanapum and John Day dams, built downstream of Grand Coulee, also will be eclipsed by the majesty of this structure. The total capacity of existing and proposed power plants on the Columbia River downstream of Grand Coulee is 7.4 million kilowatts. Proper operation of Grand Coulee alone contributes greatly to the firming up of this capability.

The cost and other nonfinancial problems involved in the acquisition of reservoir lands and in the relocation of highways and railroads are other items that often are neglected in inadequate comparative studies. In thickly-populated areas, or where the reservoir is likely to inundate good agricultural land, cost of the land may indicate that a project would not be economically feasible. Even in the northwestern United States, for some projects located in good lumbering territory, the reservoir costs are as much as 30 to 40 percent of the total cost. Political pressures may sometimes affect the size of a dam and reservoir, and therefore its cost. On the other hand, in countries like the Soviet Union it is obvious that the problems of acquiring land for a project would be secondary.

Cost per acre-foot of useful storage, or per kilowatt of installed capacity, or per kilowatt-hour of energy during an average year, or even the total cost of the project, sometimes are used for comparative study of different projects. These criteria have limited application to projects located in the same area of a country and built at about the same time. Unit cost and total cost figures, using official rates of ex-



Mauvoisin Dam, the second highest arch dam in the world.

change between various currencies, often can be fallacious. Similarly, comparing present day costs with those of the past can be misleading.

Design Criteria

Great confusion results when the design criteria are ignored in making dam comparisons. All other factors being similar, the physical dimensions of two dams frequently will differ because of differences in the allowable stresses and the required factors of safety. Divergence in method or theory of design often is apparent in the shape and size of a dam.

The cross section of a gravity dam is determined by the maximum allowable compressive and tensile stresses and the minimum required factors of safety against shearing and sliding. Fig. 3, which shows maximum nonoverflow sections of five gravity dams, is illustrative of cross section differences. All have almost identical and uniform downstream face slopes. The upstream face is vertical in about the top half of all of them. There the similarity ends, because while Shasta, Grand Coulee, and Bhakra have upstream toes, the face of Genissiat is vertical throughout and that of Grande Dixence cuts back from the vertical. Thus, design criteria cause important shape variations.

In four of the dams, the transverse joints are keyed and grouted, thus permitting monolithic behavior in all directions. Where the site is narrow and the abutments steep, torsion in the vertical blocks facilitates transfer of some of the water pressure against the dam laterally to the abutments, thus reducing compressive stresses at the downstream face and improving stresses at the upstream face of the central blocks. The stability factors also show improvement. The difference in their cross sections is, therefore, to some extent explained by the influence of the dam site shape. Grande Dixence and Bhakra are located in rather narrow V-shaped canyons with steep banks. The Shasta and Grand Coulee sites are much wider, and the lateral transfer of external forces is, therefore, quite small.

A second major cause of differences in gravity dam sections lies in the establishment of allowable stresses and stability factors. When computing stresses it is important to know if the effects of uplift forces are or are not included. Some criteria require that normal stresses at the upstream face, when calculated without including uplift at the base, should not be tensile. Others may specify that such stresses should not be less than 60 percent of water pressure at the location considered. Or it simply may be required that there should not be any tension at the upstream face. These requirements, while meeting stability requirements, differ enough so that in a large gravity dam their influence will be apparent in the cross section.

Arch dams provide the greatest contrast in design concepts, shape, and size of structure. While the common denominator is curvature, engineers differ greatly in the way they use it. Methods of design differ so greatly that it sometimes becomes necessary to treat comparisons with extreme caution and even skepticism. There may be no evidence that theoretical stresses will show reasonable agreement with those actually occurring in the dam. Therefore, designs based on methods which have been sufficiently corroborated by model tests, as well as observations of prototype behavior, should be used as the standards in comparing arch dams.

As in gravity dams, volume of concrete in an arch dam often is used as a yardstick for comparison. Everything else being equal, volume of concrete in

The arch form of Vaiont Dam as seen during construction.

an arch dam should be proportional to height of the dam and width of site. A convenient comparison is the massiveness index (MI), Fig. 2, defined as:

$$MI = (V_d \times 10^6) \div (CSF \times H^2 \times DCL^2)$$

where V_d = volume of dam, cu yd
CSF = canyon shape factor
H = maximum height, ft
DCL = developed crest length, ft

A large massiveness index is indicative not only of a more conservative design, but also of adverse site and foundation conditions which contribute to such a design. A smaller massiveness index would indicate a thinner arch dam and higher allowable design stresses. The range of values of the massiveness index for the six dams described in Figs. 1 and 2 reflects considerable divergence in design concepts and in what may be considered adequate factors of safety.

Embankment type dams rely primarily on the shear strength of compacted earthfill or rockfill for stability against failure. The cross section of the dam, its surface slopes, and its internal zoning almost directly represent criteria assumed in design, and also the quality and physical properties of the construction materials. It is interesting to review the design criteria and methods for such dams, but a study of the types of materials used is of much more importance. The design that utilizes all the material obtained from the necessary excavation for appurtenant structures at the site, and that imports the minimum of materials for the embankment, is undoubtedly the most desirable. This design is superior to the one which fulfills strict theoretical design specifications by requiring a large amount of borrowed materials, while wasting large quantities of excavated materials.

The cross sections in Fig. 4 represent seven of the highest and largest existing or proposed earthfill and rockfill dams. Brownlee and Paradela are rockfill dams, the former with a thin, sloping core of impervious material, and the latter with an upstream concrete face. Assuming foundation conditions and quality of rockfill about the same in these two dams, the difference in their upstream slopes can be attributed to the location and type of the impervious zone. Furnas Dam is classified as a composite earth and rockfill embankment which utilizes large amounts of random fill varying from decomposed schist to sound quartzite. The outer rockfill shells are composed of very slabby but sound quartzite, indicating the desirability of keeping face slopes somewhat flatter than would be permissible with more massive rockfill such as in Brownlee or Paradela dams.

The outer configurations of Trinity, Swift, and the proposed Oroville dams are strikingly similar. Where the upstream cofferdam is ultimately made a part of the dam, a berm or flatter slope is formed near the upstream toe. An alluvial or generally permeable foundation, such as at Oahe Dam, would be responsible for the greatly spread out cross section of the dam. The methods of placement and compaction of fill, the rate of construction, moisture requirements, and the degree of quality control are other factors that deserve consideration.

Dam Comparison Number

The need for making comparisons of dams as comprehensive as practical is obvious. So is the need to exercise caution in avoiding the pitfalls of unrepresentative data. Keeping these requirements in mind, is it possible to develop a parameter utilizing the more significant characteristics of dams to provide a basis for a rational, though limited, picture of comparative standing among various dams? Before any attempt is made to evolve such a parameter, it should be emphasized that it will not obviate the need for detailed comparisons. Yet the use of an easy-to-determine numerical factor which gives a quick, although incomplete, impression of the relative importance of a dam, would indeed be helpful.

The following expression for a dam comparison number (DCN) is composed of six variables, which by proper weighting should represent the structural and economic significance of a dam better than any other grouping of factors:

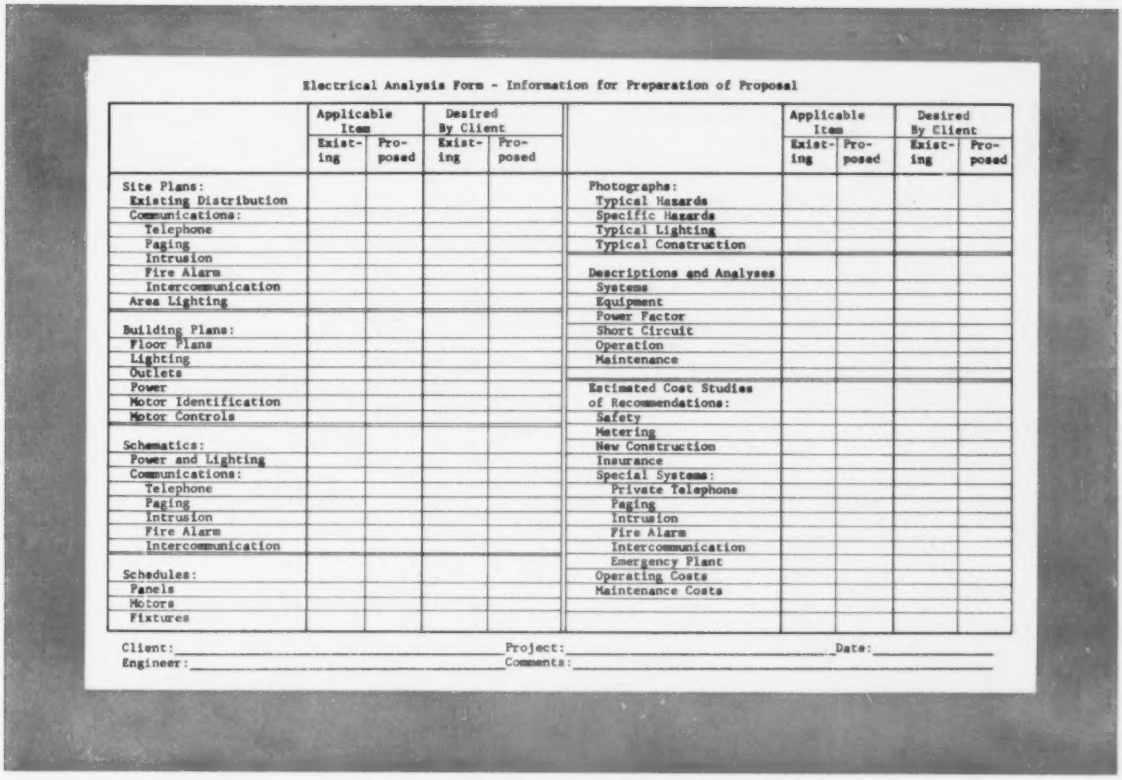
$$DCN = (H \div 100)^{1/3} + [(CV_d + V_r) \div 10^6]^{1/4} + (P \div 1000) + (Q \div 10^6)^{1/3}$$

where, DCN = dam comparison number
H = maximum structural height of dam, ft
V_d = volume of dam, cu yd
V_r = maximum reservoir capacity, acre-ft
P = installed capacity (ultimate) of powerhouse, MW
Q = maximum spillway discharge capacity, cu ft per sec
C = a constant: C = 1 for concrete dams; C = 0.25 for earth and rockfill dams

The expression and the proportions allocated to each factor are empirical and somewhat arbitrary, but when combined in this manner the net result provides a good starting point for more analysis.

Values of the dam comparison number given in Table 1 show that Grand Coulee, Kuibyshev, Kariba, and Hoover dams rank at the top of those compared. These dams are not the highest dams in their class, yet the influence of the other factors rates them as the world's most important dams.

The most useful purpose of a comparative study of dams should be to make the reviewer aware of the relative significance of each project. It should assist him in rating the position of a particular dam in the over-all field of dam design. With this comes the realization that the more "important" a dam, the greater should be the margin of safety and the more thorough the design. ▲▲



Electrical Analysis Form - Information for Preparation of Proposal

	Applicable Item		Desired By Client			Applicable Item		Desired By Client	
	Existing	Proposed	Existing	Proposed		Existing	Proposed	Existing	Proposed
Site Plans:					Photographs:				
Existing Distribution					Typical Hazards				
Communications:					Specific Hazards				
Telephone					Typical Lighting				
Paging					Typical Construction				
Intrusion									
Fire Alarm					Descriptions and Analyses				
Intercommunication					Systems				
Area Lighting					Equipment				
					Power Factor				
Building Plans:					Short Circuit				
Floor Plans					Operation				
Lighting					Maintenance				
Outlets									
Power					Estimated Cost Studies				
Motor Identification					of Recommendations:				
Motor Controls					Safety				
					Metering				
Schematics:					New Construction				
Power and Lighting					Insurance				
Communications:					Special Systems:				
Telephone					Private Telephone				
Paging					Paging				
Intrusion					Intrusion				
Fire Alarm					Fire Alarm				
Intercommunication					Intercommunication				
					Emergency Plant				
Schedules:					Operating Costs				
Panels					Maintenance Costs				
Motors									
Fixtures									

Client:_____ Project:_____ Date:_____

Engineer:_____ Comments:_____

Fig. 1 – A typical check list for use in preparing an electrical analysis, with space for listing proposed modifications.

How to Make an Engineering Analysis

ARTHUR F. WEERS, Arrowhead Engineers, Inc.

THE CONSULTING ENGINEER often is appalled at the lack of data available on existing systems in institutions, office buildings, and even modern industrial plants. His client is equally appalled when this lack of data forces the consultant to ask for a considerable amount of time and a substantial fee to determine existing conditions. Without this preliminary work the consulting engineer can offer only a patch work solution to the immediate problem at a cost within the client's budgetary limitations.

CE exclusive

This dilemma is avoided only when management anticipates its problems and authorizes the required preplanning. Then, the initial action is the employment of a consulting firm to prepare a thoroughly detailed engineering analysis.

Since the forms that analyses assume are as varied as the firms that prepare them, an electrical system analysis has been selected to illustrate the work of the consulting firm. It will be apparent, however, that similar analyses are readily adaptable to all other plant components – mechanical, gas, water, heating, ventilating, and air conditioning.

Scope and Fees — The Proposal

Analyses vary from simple abstracts of several pages, indicating areas of hazard and inadequacies, to scale floor plans of entire existing systems and proposed modifications, accompanied by hundreds of sheets of descriptions, photographs, cost analyses, recommendations, and preliminary specifications for modifications. As a result, the fee may range from only a few

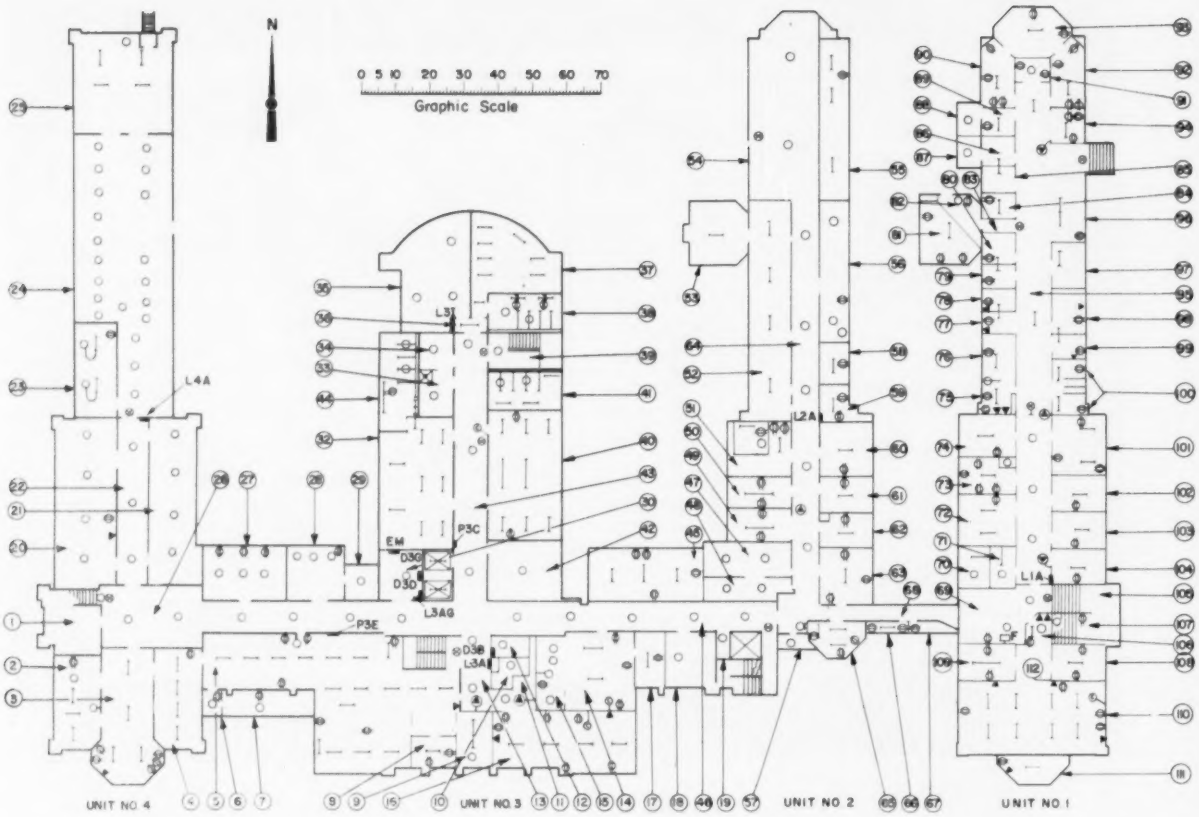


Fig. 2 – Floor plan of a building, showing existing outlets, fixtures, and panels. Room key numbers refer to Fig. 3.

hundred dollars to as much as 10 percent of the value of the existing installation, and still be entirely proper for the service rendered.

Perhaps in no other field of practice is the engineer so morally obligated to render service to the full extent of his understanding with his client. Therefore, it is essential that the scope of the work be outlined clearly before the project is undertaken.

Regardless of the amount of detail, the analysis should include:

¶ Existing conditions – descriptions and drawings with emphasis on hazards and inadequacies.

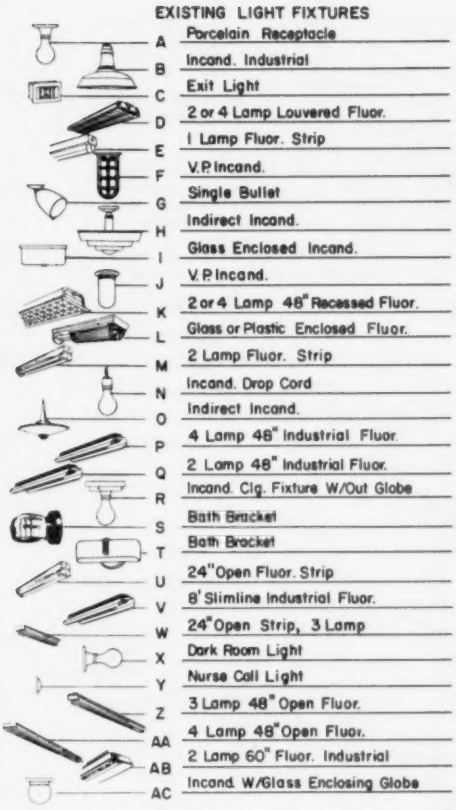
¶ Recommendations – in sufficient detail to inform the client about possible methods of problem solution.

¶ Cost estimates – of the value of the existing plant, if requested by the client, and the investment required for any recommended modifications.

An essential tool for the consulting firm in establishing the scope of an analysis is an outline check sheet of the factors applicable to the proposed project. A typical check list (Fig. 1) also includes space to indicate the items which the client has requested the engineer to study, as well as space for listing proposed additions or modifications that should be considered. Each of the items listed may involve an extensive study and technical design, or the entire analysis may involve only one or two of the listed items, such as power factor or short circuit interrupting capacity.

Drawings

Site and building plans should be included if at all commensurate with the agreed upon scope and fee. These may vary from simple building outline sketches to complete floor plans, but the engineer usually will find that complete as-built floor plans are not available from the client's files. Hence, using as much as is on hand, he often will be required to prepare site and floor plans as part of his work. These, however, are not working drawings, so small-scale, single-line drawings can be used, with the actual scale depending on the complexity of the project. In final form, 1/32″ = 1′0″ for architectural plans and 1″ = 100′0″ for plot plans is often satisfactory. One method of preparation consists of drawing originals to a larger scale, printing reproducibles for the various systems involved, and finally reducing the entire set of drawings to a convenient size for ready reference.



Letter code designating the types of light fixtures.

Panel L 5 A

Room No.	Room Use	Fixture Type	Light Watts	Conv. Outlet Watts	Ult. Load Watts	Remarks: Replace All Ltg/New	Remarks: Add Conv. Outlet
1	Storage	L	400	300	1500	Replace Ltg/New	
5	Office	L	200	300	450	"	
6	Office	L	200	150	450	"	
7	Assembly Hall	L	400	450	1100	"	
8	Storage	R	150		300	"	
9	Conference Room	P	400	150	700	"	
10	Rest	R	100		300	"	
11	Office	P	800	450	700	"	
12	Office	P	400	300	475	"	
13	Office	P	400	300	500	"	
14	Office	P	400	150	600	"	
15	Office	O	200	150	500	"	
16	Office			300	600	"	1
18	Storage	R	100	150	350	"	
19	Rest	R	100	75	300	"	
20	Hall	L	200		400	"	1
2	Office	L	200	300	450	"	
3	Office	L	200	300	450	"	
4	Office	L	200	300	450	"	
17	Office	L	1060	600	1300	"	
Totals			6110	4725	11675		

Panel L 12 B

1	Office	O	200	150	550	Replace Ltg/New	
2	Storage	R	60		150	"	
3	Printing Off.	O+M	300	3015	3615	"	
4	Hall	R	420	950	1650	"	
5	Office	O	200	650	1100	"	
6	Hall			575	775	"	
7	Office	K	90	270	400	"	
8	Office	K	460	210	670		
9	Office	K	460	210	670		
10	Office	K	460	210	670		
11	Office	K	400	310	710		
12	Office	O	200	150	550		
13	Closet	-	---	---	100	"	
14	Restroom	R	100		400	"	
15	Office	O	320	300	1100	"	
16	Office	O	200	150	550	"	
Totals			3870	7150	13660		

Fig. 3 — Supplemental chart, detailing data and remarks from Fig. 2.

The treatment of drawings will determine the size, binding, and assembly of the completed analysis. While 8½" x 11" matter is most easily printed, handled, and filed, drawings of this size are adequate only for schematic indications or small area presentations. However, an 11" x 17" drawing is easily read if reduced from as large as 27" x 42" — if the lettering is kept large and fine detail is omitted.

If a large number of drawings are involved, the entire analysis may be bound as an 11" x 17" presentation. If only a few drawings are required, they may be single or accordian folded for use in a report of standard 8½" x 11" size.

Any one of several methods can be used to indicate existing electrical items on floor plans. In Fig. 2, outlets, lighting fixtures, and panels are shown directly on the plans, and the key numbers also are scheduled separately in tabular form (Fig. 3) to indicate more detail. This method has the advantage of being usable with different schedules to show a great amount of detail. It is especially valuable when an electrical analysis is combined with mechanical system details, or even door and window hardware, furniture, and other items. A separate floor plan facing each schedule then produces the most easily read and understandable presentation.

Site and distribution plans can be treated in a similar manner. Reduced scale drawings with only one or two systems per drawing are again the most easily understood. Schematic drawings often are placed on the same sheets, as shown in Fig. 4.

Descriptions and Recommendations

After the existing facilities have been drawn, the description of conditions and the indication of hazards is greatly simplified. For major hazards, actual photographs make the most impressive illustrations.

Recommendations as to how hazards and inadequacies can be corrected should be both written and illustrated with drawings. These should not be in great detail, but merely indicate possible solutions to the problems encountered. Often it is necessary to show proposed modifications as alternate methods or stages, as indicated by Fig. 5.

Cost Estimates and Abstract

One item of prime interest to management is the engineer's estimate of the probable costs of recom-

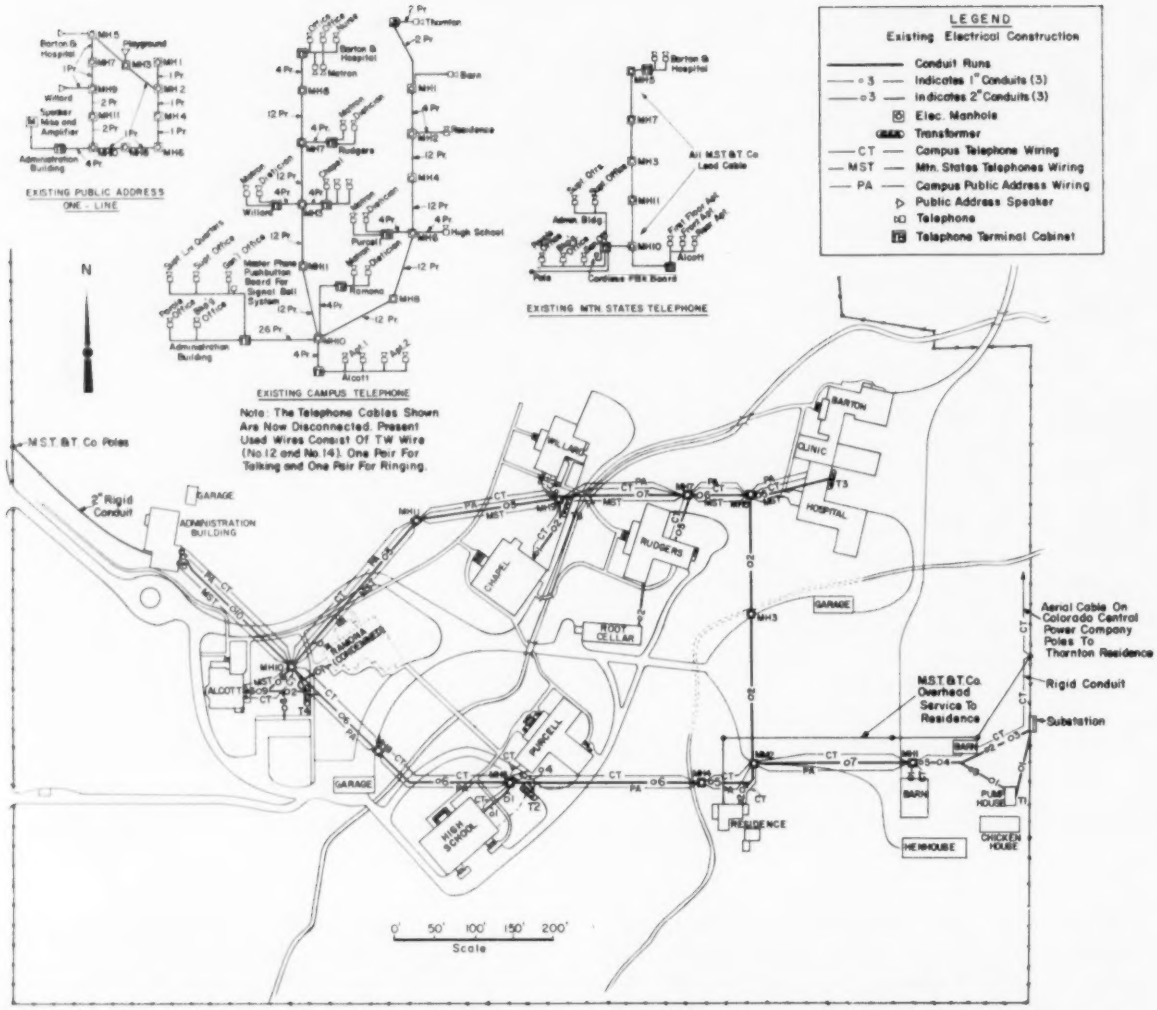
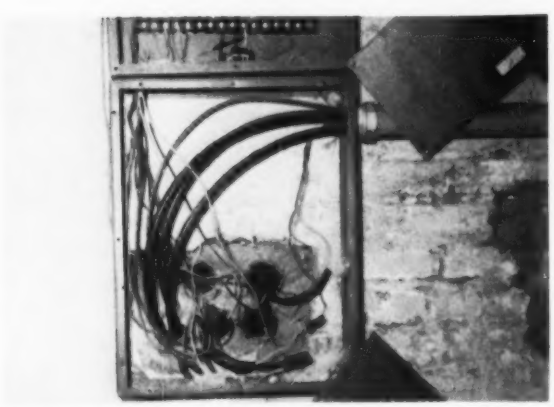


Fig. 4 – Reduced-scale site and distribution plan. Additional schematic drawings often are placed on same sheet.



Photographs of existing wiring conditions can be used to good advantage in emphasizing the importance of the work.

A close-up photograph will show in detail the actual situation, and justify any recommendations for improvement.

mended work. This should be presented in a manner that provides as much detail as possible, but an easily read summary of conclusions, as shown in Fig. 6, is of greatest importance. It gives the client a clear picture of the actual cost involved in both necessary and desirable alterations.

Finally, an abstract should be written which summarizes the conclusions reached. This should be as brief as possible and, although written last, should be assembled in the report immediately following the title sheet or table of contents.

Advantages

Analyses also have a number of uses which are not immediately apparent. It is recommended not only that the bound report be kept for instant reference, but that unbound copies of the drawings be filed for maintenance purposes. When a failure or maintenance problem occurs in an area, a sheet covering that area can be pulled, the location of trouble circled, the scheduled data noted, and the sheet given to the maintenance staff. This anticipates the printing of the analysis by the offset method, allowing a large number of copies at minimum cost and making individual sheets expendable for the many future uses to which they may be put.

While analyses at first appear to be applicable only to installations that have been in existence for a number of years, it also is entirely feasible to make an analysis of a new installation immediately after it is occupied and the operational problems are known. This is especially true of industrial plants, where the original drawings of the buildings and services seldom include equipment details. The confusing maze of "as-built" drawings, modifications during construction, and ultimate installation details require consolidation to determine final adequacies and to provide the maintenance staff with a set of usable data. ▲▲

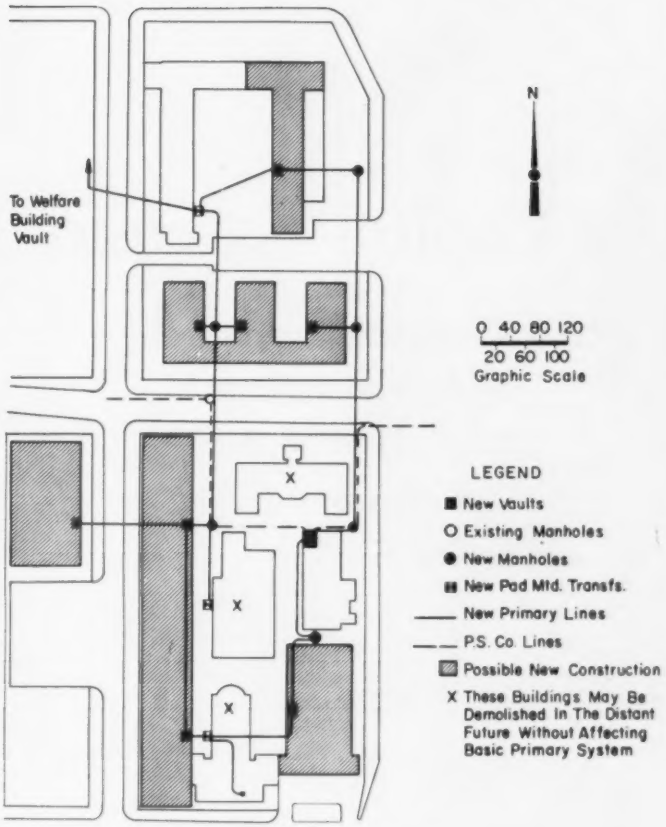


Fig. 5 – Proposed modifications, shown as alternate methods or stages.

Summary by Units

First Priority - This work must be done if these buildings are to continue in operation

Second Priority - This work should be done to achieve satisfactory working conditions

Third Priority - This work should be done to assure excellent working conditions

		First Priority	Second Priority	Third Priority	Total
Basic to Institution		$ 128,375	$ --	$ 25,000	$ 153,375
Unit	1	15,010	17,500	14,000	46,510
	2	10,370	14,750	11,000	36,120
	3	33,560	40,000	27,000	100,560
	4	13,120	18,500	14,500	46,120
	5	2,939	2,200	3,700	8,839
	7	21,135	16,800	14,000	51,935
	8	11,679	6,000	7,800	25,479
	9	16,659	32,000	21,500	90,159
	10	7,777	2,900	1,700	12,377
	11	8,580	6,200	2,600	17,380
	12	4,355	3,300	2,900	10,555
	13	5,073	5,500	4,100	14,673
	15	11,780	28,500	13,000	53,280
Totals		$ 290,412	$ 214,150	$ 162,800	$ 667,362
Engineers Fee + Contingency		$ 31,945	$ 23,556	$ 17,908	$ 73,409
Total Units		$ 322,357	$ 237,706	$ 180,708	$ 740,771

Fig. 6 – A detailed summary should be made of the survey's results.

The Capitol Extension

A composite report from the consulting firms that worked on the 32-ft extension of the Capitol Building

The south end of the Capitol arcade section during erection of the superstructure.

CE exclusive

MANY VARIED engineering and architectural talents are required for a project as important as the extension of the East Front of the U. S. Capitol. Obviously, J. George Stewart, Architect of the Capitol, knew just where to get qualified assistance, for he called upon a distinguished group of private practitioners. For these participants, the assignments have been challenging – the results gratifying.

Basically, the project involved the construction of a 32½-ft wide extension across the length of the East Central Front of the Capitol (De Witt, Poor & Shelton, of Washington, D. C., were the architects). This addition provides new space for offices, subcommittee rooms, dining rooms, reception rooms, and storage rooms for Congressional functions. It also creates a new exterior front wall to replace the old wall, which was in need of repair because of long weathering as well as damage caused by a serious fire in the early part of the 19th century. Every detail of the original architecture is recreated in the new facade, except that marble has been substituted for sandstone.

Te delineate the problems involved in the work, it is necessary to recall the primary parts of the Capitol Building. These are the central section, the connections, and the present House and Senate wings. The central section, or original Capitol, includes the large dome and rotunda, and actually contains three areas – the Central Portico and wings on each side. Originally these wings contained the chambers for the House, Senate, and Supreme Court, but now they are recognized as the Statuary Hall and the old Senate and Supreme Court Chambers. The connections are the passageway structures connecting the present House and Senate wings to the central section.

Since the existing structure was built over a long period of years, with each stage being constructed in accordance with the methods employed at the particular time, the building today is a monument to the evolution of construction practices. Brick arch type construction was employed in the original central section for the support of all floors and portions of the roof. Then, when the House and Senate wings and connections were added later, they were constructed from a combination of brick arches, stone slabs, and flat brick arch floors supported on steel beams.

This type of construction obviously poses major problems when planning an addition to the existing structure. Brick arches are particularly vulnerable to serious damage by any differential settlement of their supports, so adding any new loads to the existing footings had to be avoided. Consequently, the addition at the central section was designed as an independent structure that is supported on its own new footings.

And, since the old front wall was subject to movement because of the cracks resulting from a fire in the early 1800s, it was desirable to use the new structure as a buttress to prevent any possible outward displacement of the old wall.

There also were other considerations. Services in the existing building could not be interrupted during construction, and the work had to be scheduled so that at least the exterior of the building would give the appearance that the project was complete by the time of the inauguration. Success in meeting all these demands is a tribute to the consulting engineering firms:

¶ Moran, Proctor, Mueser & Rutledge, on investigation of subsoil conditions within and immediately adjacent to the area of the Capitol. The firm also conducted a test pit program to determine the nature and characteristics of the foundations supporting the existing structures. Designs for the new foundations, and underpinning of existing footings where necessary, were based on the results of these studies.

¶ Severud-Elstad-Krueger-Associates, on the structural engineering for the superstructure portion of the project, including the design details for buttressing the old front wall.

¶ Guy B. Panero Engineers, on design of the mechanical and electrical facilities, including the provisions for adding numerous services in the future.

The columns for the central portico are lifted into place by cranes. Each massive column is a solid piece of marble.

Capitol Extension

Foundation Work

Moran, Proctor,
Mueser & Rutledge

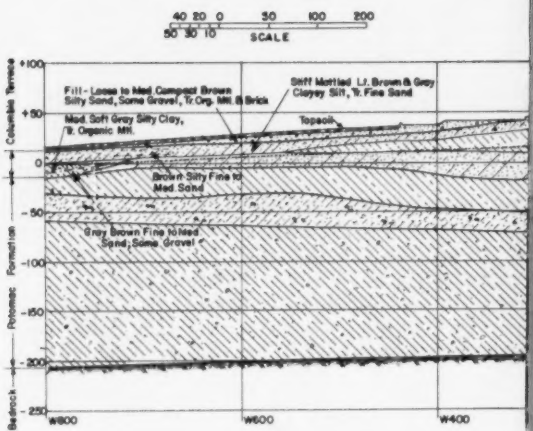


Fig. 1 — Subsoil conditions below the Capitol. The building rests on the "Columbia" formation.

TWO DISTINCTIVE subsoil conditions, divided along a north-south line, prevail at the Capitol grounds.

As shown in Fig. 1, the building itself rests on the west boundary of a stream terrace deposit of the Columbia formation, which continues eastward across the grounds. This stream terrace is composed of two subsoil strata extending for a combined depth of from 25′ to 50′ below the ground surface. The lower layer is a very compact sand and gravel, with boulders, which grades upward into the surface layer of compact silty fine sand. The lower of the main foundation walls of the Capitol building — those below about elevation +70 — rest on the sand and gravel stratum. The shallower of the main foundations are supported on the upper layer of sand and silt.

West of the Capitol building, artificial fill of loose to medium compact silty sand generally underlies the surface to an average depth of 10′ and as much as 25′. Beneath the fill is a stiff clayey silt of a younger Columbia terrace deposit up to 20′ in thickness. Foundation walls and piers of the Capitol's terrace structure generally are supported in this stratum.

The principal bearing walls of the Capitol building are of continuous masonry construction, and they are carried to the depth of the granular Columbia stream terrace materials. Some secondary foundations are at shallower depths, and these are supported on the miscellaneous fill. Successive floor heights of the bearing walls are constructed of progressively narrower vertical walls, connected by systems of continuous arches that then form the bases of the next levels.

Exisiting Foundation

Foundations are mainly rough cut gneiss or diorite stone, set in random or coursed layers in fairly uniform sizes. The characteristic of the bonding or joint filler material is consistent, being uniformly hard and well packed. The only exception is in the central rotunda, where the material was found to be soft and crumbly until exposed to the air. After exposure to the air, it hardened.

Depths of the foundations below the basement floor vary greatly, indicating that the original builders had attempted to carry these walls to the natural ground contours at the site. Depths range from 3′-8″ for the interior foundation walls of the central rotunda to 5′ to 9 ′ for the easterly walls, and 5′ to 14′ for the westerly walls, in the old Senate and House sections. Interior foundation subgrades also are extremely irregular — from 8″ to as much as 8′ below the basement floor level of the building.

These characteristics of the bearing wall construction made the analysis of foundation bearing intensities a complicated task. Computations indicated that a maximum intensity of 14,000 psf occurs under the walls of the main rotunda, which support the cast-iron dome. Bearing intensities of other principal foundation walls average 10,000 psf, while those in the

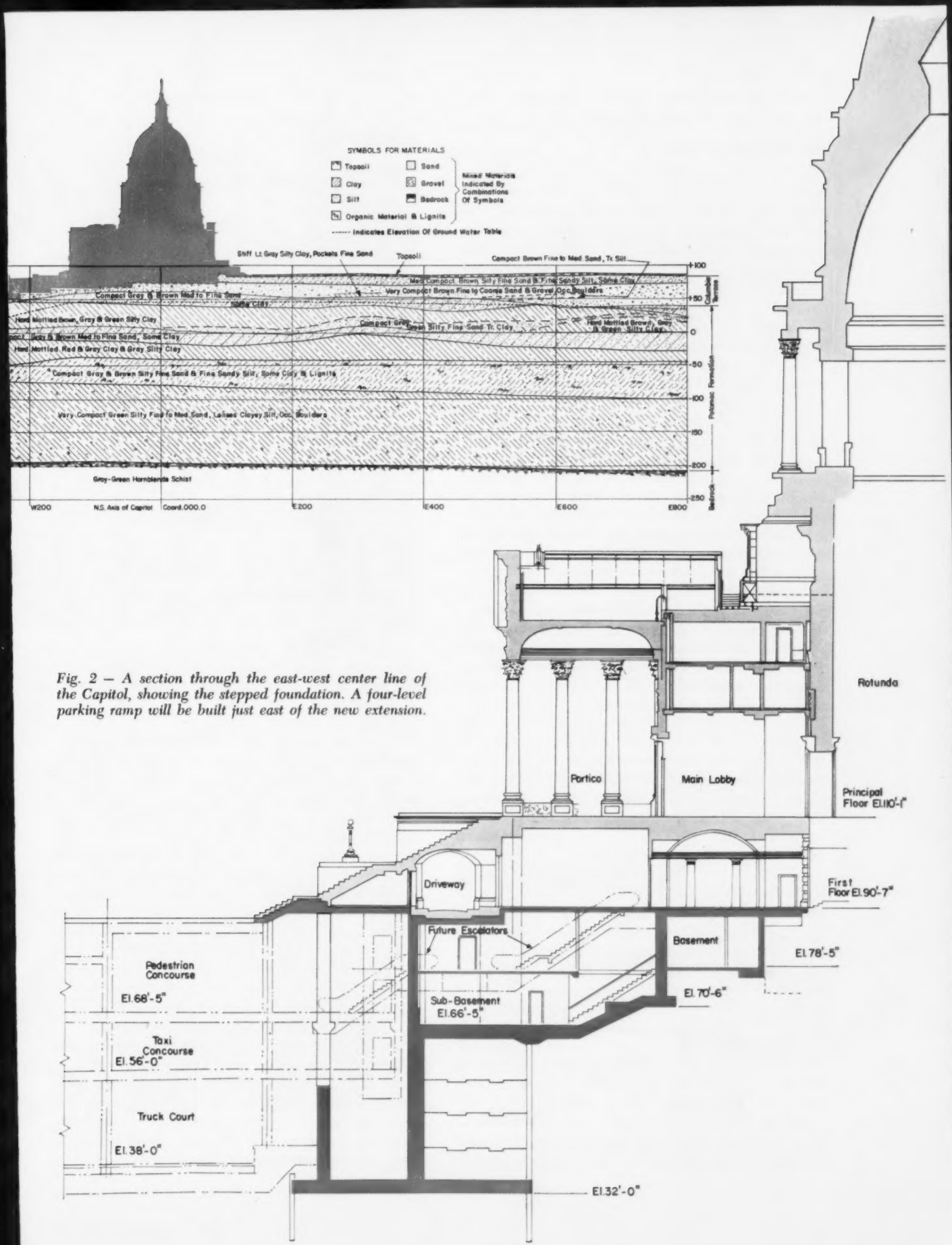


Fig. 2 — A section through the east-west center line of the Capitol, showing the stepped foundation. A four-level parking ramp will be built just east of the new extension.

connections between the original Capitol and the Senate and House wings average 8000 psf.

New Foundation Work

After the subsoil conditions and characteristics of the existing structure were established, the new foundations required for the new easterly extension were designed. These were based not only on present requirements, but also on the anticipated future addition of a four-level underground garage, to be located immediately to the east of this extension. It was, therefore, necessary to place the foundations below the lowest anticipated level at the face of the common boundary wall and to step the foundation progressively upward towards the west. As shown in Fig. 2, this minimized the undermining and underpinning of the existing foundations.

The anticipated depth of the future foundations and the limited work area made it necessary to construct the deepest sections within a cofferdam. Because of the nature of the loads at the centerline, it was found desirable to place the entire central portion of the new construction on a mat foundation. Provisions also were made to support the future floors, to permit future openings for access, and to assure water tightness of all present and future construction.

Foundations for the wings, immediately adjacent to the dome and north and south thereof, were designed as continuous footings (see Fig. 3). The floors supported on these foundations were cantilevered to meet the existing structure; they do not bear on, or transfer any load to the existing structure, so that it remains unaffected by the new construction.

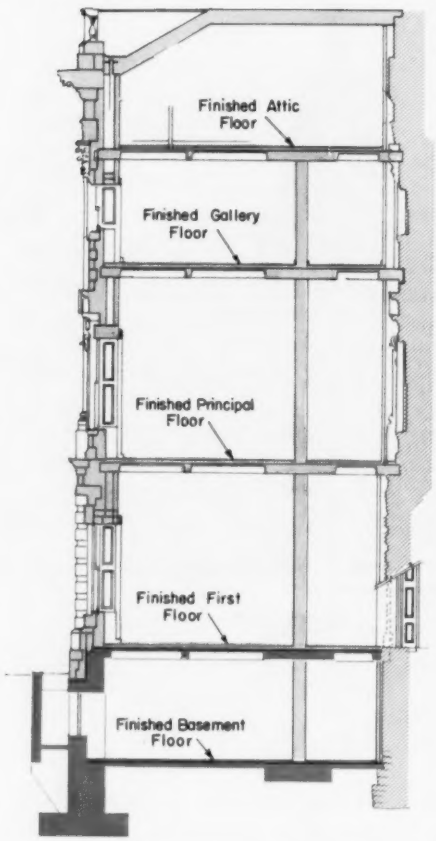


Fig. 3 — The wing immediately adjacent to the dome, showing continuous footings under cantilevered floors.

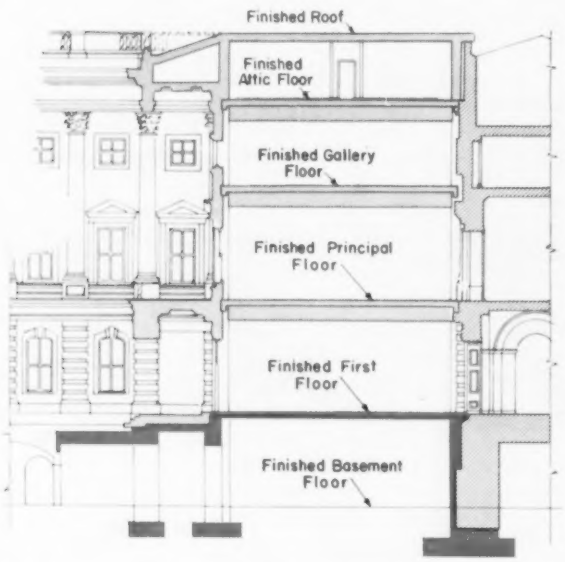
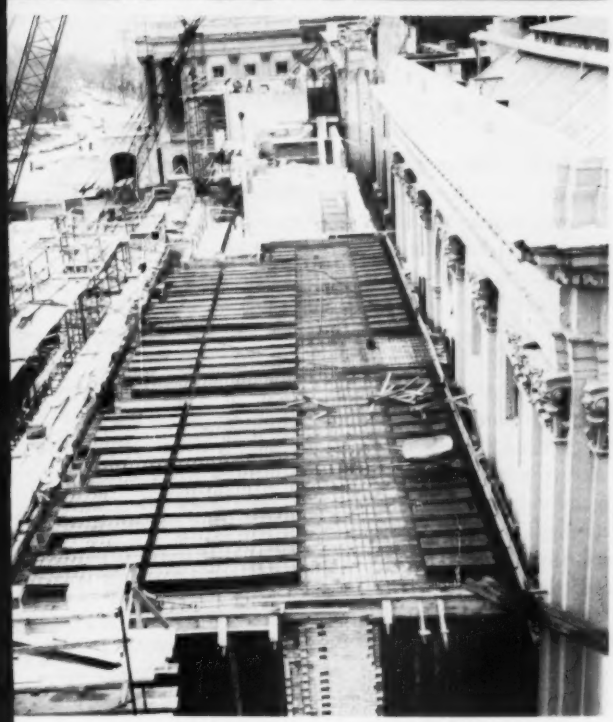


Fig. 4 — Passages connecting wings had to be built with floor supports directly above the existing foundation wall.

In the connections between the original Capitol and the Senate and House wings, an entirely different problem arose. Because of limited space, the interior steel columns supporting the intermediate floor levels had to be placed immediately above the outer edge of the existing 8′ thick rubble foundation wall (see Fig. 4). Since additionally applied eccentric loads would have seriously affected the stability and safety of these foundations, it was necessary to construct a continuous concrete beam to distribute the steel column loadings along the length of the wall. Maintaining the soil bearing pressure within the same relative intensity required the addition of new spread footings. This was accomplished by underpinning the original foundations to support building loads during construction of the new, wide footings.

The outer foundation walls, supporting similar steel columns and the outer colonnades, are supported on new continuous spread footings. Where existing foundations were found to be too shallow to permit the safe construction of the adjacent new foundations, they were underpinned to depths at least 2′ below the proposed adjacent footing subgrade.



Erection of the steel framing (top) used in the connecting section at the House wing. Slab framing (bottom) that is used for all floors of the Central section of the Capitol.

Capitol Extension

Structural Framing

Severud-Elstad-
Krueger-Associates

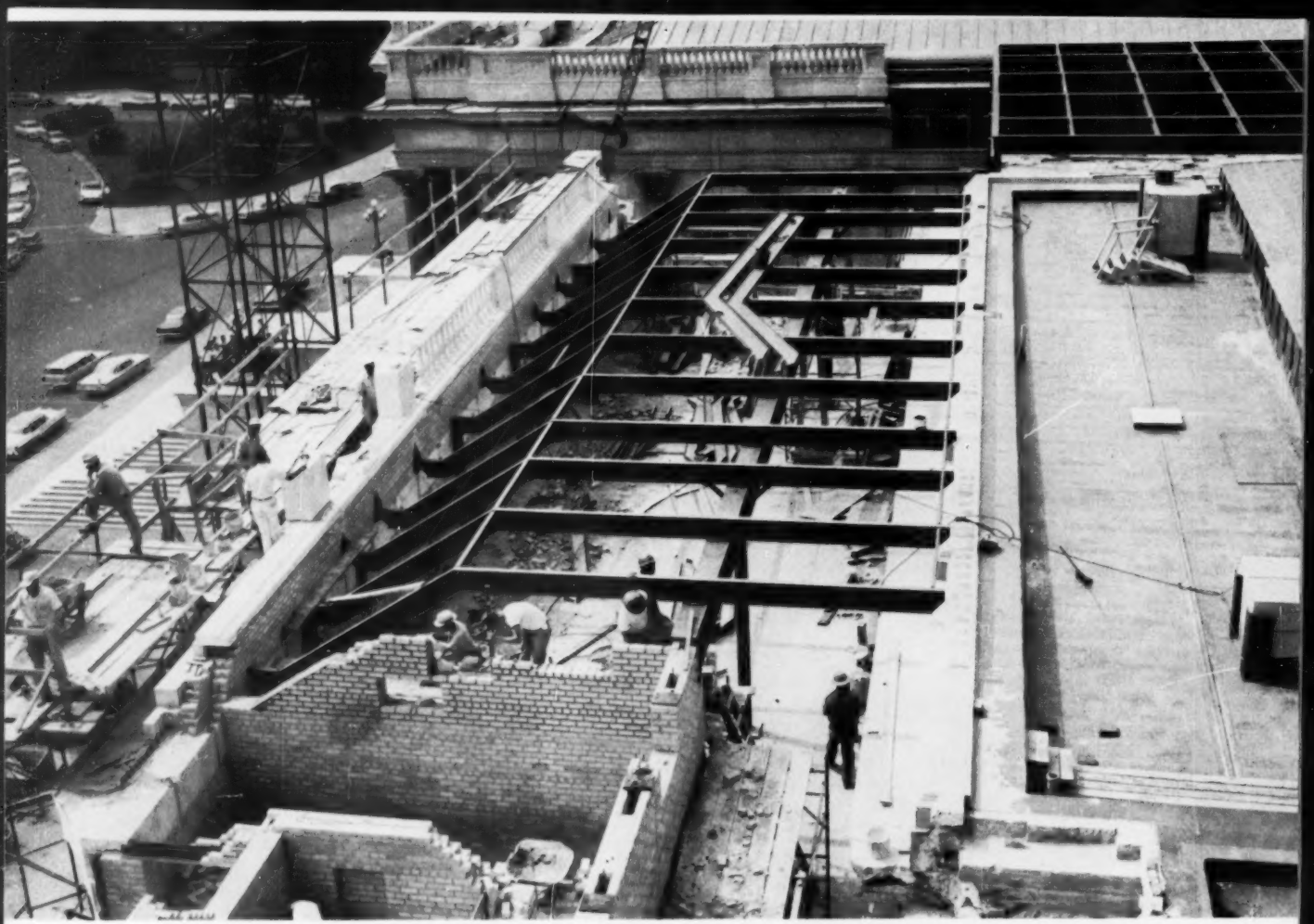
STRUCTURAL FRAMING for the new extension at the central section consists of ribbed reinforced concrete slab floors supported on masonry bearing walls. At the connection sections, the construction is steel framing and reinforced concrete slab floors, except for the porticos where the existing stone slabs and columns were re-erected. The entire roof of the new addition is decked with precast concrete plank and supported on steel framing.

Primarily, the structure at the central section consists of two parallel bearing walls. One is the new East Front wall, and the other is a new interior corridor wall located approximately 10′ in front of the old face. The ribbed slabs are designed to span from the new front and cantilever over the interior wall to butt against the old front. In this way, the slabs pick up the new vertical loads and also act as a buttress to transfer lateral loads. Masonry cross walls complete the buttressing.

Contrast of Construction Methods

This extension offers a sharp contrast to the structural framing in the original building, and illustrates the great improvement in construction methods.

To minimize the possibility of transferring any vertical loads onto the existing structure from the cantilever at the butt joint, the buttressing actually was accomplished through a system of key and anchor slabs. The cantilever slabs extend to within 1′ to 2′ of the front of the old wall face, and the key slabs are small fill-in sections that close the gap between the wall and the cantilever. They are located at intermittent points along the wall as necessary to receive the load, but they were not poured until after the major structural work had been completed. By delaying the pouring of the gaps in this way, the initial settlement



The steel roof framing of the central section. The entire roof of the new addition is decked with precast concrete plank.

and deflections of the new construction had taken place before they could cause a transfer of vertical load across the keys onto the existing structure.

Perhaps of most importance is the increased area of usable space in a building of given size. Before the advent of concrete and steel beam framing, all spans were constructed from masonry arches or heavy stone slabs, and required heavy, massive buttresses that consumed a large portion of the available floor space. In this new extension, the bearing walls only occupy approximately 10 percent of the building. If brick arch construction had been employed as in the existing structure, over 40 percent of the usable space would have been taken up by the supporting walls.

Also, the relatively shallow construction depth required for beam framing, as opposed to arch construction, increases the total volume of usable space. In some instances, the lower headroom requirements could permit the installation of additional intermediate floor levels or open up space not previously accessible. As an example, much of the attic space in the old structure is taken up by the vaulted ceilings of the rooms below, but in the new extension, all of this space has been utilized to provide highly desirable offices. Likewise, the space over the old Central Portico was previously of no value; now it houses much of the air conditioning equipment for the new addition. Duct work for the air conditioning system is in the space between the floor slabs and the hung ceilings.

Front Steps and Portico

The famous inaugural steps previously were supported on brick arches that spanned in the sloping direction of the steps, and the stone steps then spanned across them. Although the granite stones were reused in the reconstruction of these steps, they now are supported on a reinforced concrete slab. The soffit of the slab also forms one half of the arched ceiling in the driveway under the steps. The remainder of this ceiling arch is a monolithic concrete shell.

Framing for the Central Portico floor is concrete beams and slabs supported on masonry piers located at each of the marble columns above. The marble columns are solid stone and, except for the bases and caps, are of one piece. They support the concrete floor of the attic above.

Guy B. Panero Engineers

Mechanical and Electrical Work

MECHANICAL AND ELECTRICAL WORK for extending the East Front of the Capitol was done in three phases:
¶ Relocation of existing facilities, in conflict with the new construction. Breaking into existing services for new connections was done after office hours, or at times when these services could be interrupted.
¶ Foundations and superstructure provisions for mechanical and electrical installations included only those parts of the ultimate facilities which had to be constructed as integral components of the structure. Included were roof, floor, and area drainage facilities; fire protection pipe lines; and many of the underground electrical, steam, sewer, and storm drainage systems. Since the longitudinal walls forming the main corridors and some of the transverse partitions are supporting members for the floors, it was necessary to provide adequate openings in the new masonry construction for the mechanical and electrical facilities to be installed under the third stage of the project.
¶ Interior and related mechanical and electrical work included all essential building services – heating, cooling, ventilation, sanitation, fire protection, vertical transportation, hot and cold water distribution, lighting, communications, and culinary facilities.

Heating, Ventilating, and Air Conditioning

The air conditioning system is designed to maintain 76 F db and 50% rh when the outdoor conditions do not exceed 95 F db and 78 F wb. Since the Capitol is served with chilled water from a remotely located central refrigeration plant, which normally shuts down by the end of November, an air conditioning system was selected that would provide satisfactory room conditions by the introduction of low temperature outdoor air during the noncooling season.

Selection was governed by a number of factors. Provision for a possible eventual lighting load of 10 or more watts per square foot for all offices and committee rooms, and the rather large window areas, contribute an abnormally high room sensible load. To overcome this circumstance partially, most of the return air is exhausted from the offices and other occupied areas through the hung ceilings and returned to the cooling apparatus, thus removing a large percentage of the lighting heat load.

In all, there are seven air handling systems. Two are located on the basement floor. They serve the basement areas – one for the House side and one for the Senate side. These are of the low pressure, single zone type. The other five are double duct, high pressure systems, located on the attic floor. Two serve the three floors of the House side, two the three floors of the Senate side, and the fifth the entire attic floor.

Since the occupants of the attic floor will require air conditioning during off hours, when the central chilled water supply system is shut down, a separate 50-ton water chiller was provided for the attic floor rooms. It is interconnected with the central system so that it starts or stops automatically, depending on whether the central plant is shut down or in operation.

Provision has been made for another air conditioning system in the basement on the Senate side, to take care of the new Senate kitchen and miscellaneous spaces in that area. This unit will handle 100% outdoor air, with all air exhausted to the roof.

Electrical Systems

Electrical energy is obtained from the 480-volt, 3-wire distribution system of the Capitol building, and fed into the extension from both the House side and the Senate side. Panelboards in the basement distribute the 480 volt, 3 phase, 60 cycle service to dry type transformers, located in electrical closets throughout the extension. The secondary service from each closet is 120-208 volts, 3 phase, 4-wire. All motors of ¾ hp and above are 440 volts and serviced by separate feeders.

Electrical facilities include:
¶ Incandescent fixtures for general illumination and decorative lighting; fluorescent fixtures for general illumination on the attic and basement levels, in corridors, in caves, and also for some special applications.
¶ Complete, triple-duct, steel underfloor duct systems in all office areas, capable of servicing a.c., telephone, and any low tension intercom system required.
¶ A Legislative call system, designed to operate with the electronic clock system to provide the necessary legislative call from either the House or the Senate.
¶ An empty conduit system for future connection of interior fire alarms to a central system.
¶ An empty conduit for a future bird repellent system.
¶ A complete empty conduit telephone system, including strip boxes and necessary header ducts to the underfloor duct system, fully in accordance with local telephone company requirements.
¶ Necessary service outlets and empty conduits for a complete television and sound producing system for broadcasting, all in accordance with the local television company's requirements. ▲▲

Belidor's *La Science des Ingenieurs*

JAMES KIP FINCH, Dean Emeritus
Renwick Professor of Civil Engineering
Columbia University

The 18th century in France witnessed the production of a remarkable number of interesting and copiously illustrated books about engineers and engineering. Among these, the five quarto volumes of Bernard Forest Belidor (1669-1761) are outstanding. Close to 500 pages each, with dozens of skillfully engraved folding plates, they are notable examples of bookmaking in a period when France led the world in art and engineering. They are both works of art and engineering classics.

Belidor studied mathematics and natural science, and worked with Cassini and La Hire in extending northward the arc of the earth's surface that had been measured by the pioneer of geodetic surveying, Picard. His interests, however, were in practical rather than in pure science; he studied ballistics and became a professor at the famous French Artillery School of La Fere. He was also an active soldier, a lieutenant colonel, a *marechal de camp* and *Inspecteur de l'artillerie*, serving in several campaigns.

Belidor's first major book, published in Paris, in 1729, was entitled: *La Science des ingenieurs dans la conduite des travaux de fortifications et d'architecture Civile*, which appears to have been the first use of the term "engineering science." It was followed, at intervals, by four other equally ponderous volumes, comprising his famous *Architecture hydraulique*, a monumental work which is of interest not only to civil but also to mechanical engineers. It contains descriptions of the machines of the day from pile drivers to dredges to pumps; it also reveals an awakening interest in measuring performance and efficiency. Belidor's books reflect the increasing efforts to replace earlier empirical practices by more accurate, quantitative methods in engineering design.

CE exclusive

Being a military man, and living in an age when war was a major activity, Belidor could be expected to emphasize the military aspects of his profession. Actually, however, his works make clear that the wide interests and varied activities of the French military engineer included a number of other undertakings in the domain of what he characterizes as *Architecture Civile*. Thus, as Belidor states: "If one examines the interior of (fortified) Places, one sees works of all kinds: one notes the City Gates, the Bridges, the Cofferdams, the Tunnels, the Arsenals, the Reservoirs, &c., which go into their execution. Thus, one may venture to say that the good engineer is a universal man, & that nothing has brought greater honor to France than the very great number who are capable of all the things of which I have given plans."

He presents this work to the King, Louis XV, stating, "It may prove to be useful when he wishes to make the Frontiers more respectable than in the past, in leaving less to chance in the undertakings of those who serve zealously for his Majesty's Glory, in occupying usefully the Troops, & in serving to bring about an abundance in his Royalty by funds which pass into the hands of his Subjects."

THE VOLUME *Architecture Civile* comprises six books, the first four of which are particularly interesting to the

civil engineer. They deal with the three major problems — retaining walls, arches, and beams — which first stirred engineering interest in the development of what is now known as structural mechanics. The remaining books deal with planning and design of military buildings, including a concise outline of the standardized proportions of the Orders of Architecture, columns, and entablatures.

RETAINING WALLS, essential to the construction of fortifications, were of special interest to Belidor and claimed his first attention. In Book I he shows "the manner of using the principles of mechanics, to give the dimensions which are proper for the revetment of Works of Fortification, so they will be in equilibrium, with the forces of the Earth which they are to sustain." He first demonstrates the center of gravity of the figures — rectangles, triangles, trapezoids — into which retaining walls and other areas may be divided. This is followed by a discussion of the essential relationship for equilibrium between the overturning moment of earth pressure and the righting moment of walls of different cross sections, assuming possible rotation about the front corner of their bases.

In Chapter IV he shows "how to calculate the pressure of Earth for proportioning the thickness of the Walls which they must sustain in equilibrium."

"It is a matter demonstrated by experience," observes Belidor, "that ordinary Earths, which have been newly placed & put one on the other without tamping or being held by any covering, take of themselves an inclination or slope, which makes with the horizontal an angle of 45°, . . . I say that this refers to ordinary Earths; because we do not ignore that if they are sandy, they do not take an angle as steep, & if on the contrary they are thick & strong they do not take one sloping as much, but, to settle on something fixed, we have supposed an earth which falls in the middle between these two." He assumes a 45 degree slope.

Illustrating the action of a mass of earth above this slope and behind a vertical wall, he shows (Fig. 1) a sphere supported by a pull K or a pressure P. He states correctly that, since the slope is 45 degrees, either K or P would be equal to the weight of the sphere. He observes, however, that a spherical ball on a well-polished plane cannot be compared to a mass of earth, whose particles resist sliding. Referring to the second diagram, Belidor notes that the pressure Q that the earth exerts is ". . . but a part of the force . . . if it were formed in a spherical body."

Belidor figures that the triangular fill back of a wall is divided into a series of uniform layers. Neglecting friction, each of these would produce a horizontal thrust against the wall equal to its weight. Reducing this to one half to allow for the "tenacity," or friction, of the earth, he sums up the overturning moment of each of these layers about the base.

Belidor computes both this overturning moment and the righting moment of the wall about the toe as area-moments. He allows for the difference in unit weights of the earth and wall by reducing the area-moment of the earth by one third before equating it with the area-moment of the wall. In this way he arrives at the necessary width of the wall to balance overturning. Furthermore, he states, he would "give to the wall a little more thickness than that found for exact equilibrium," remarking that, if "the wall sustains not only the weight of earth but of wagons & the shock which they cause . . . he would give a quarter more force than necessary for equilibrium."

Belidor also investigates the pressure on a fortification wall surcharged with the weight of an earthen rampart. The counterfort type of wall, then widely used, also receives attention. "All the world," he says, "knows that the counterforts which one builds with walls contribute much of their strength against the pressure of the Earth or of the Arches which they may sustain." In order to aid those who cannot follow his analysis, he provides one table giving the widths of walls for various pressures, and another based on the earlier suggestions of Marshall Vauban, which Gautier reported to have been used with success.

Belidor failed to obtain the pressure of a material having qualities comparable to those of any natural earth, and his studies were limited to overturning. (The questions of base pressure and foundation needs were

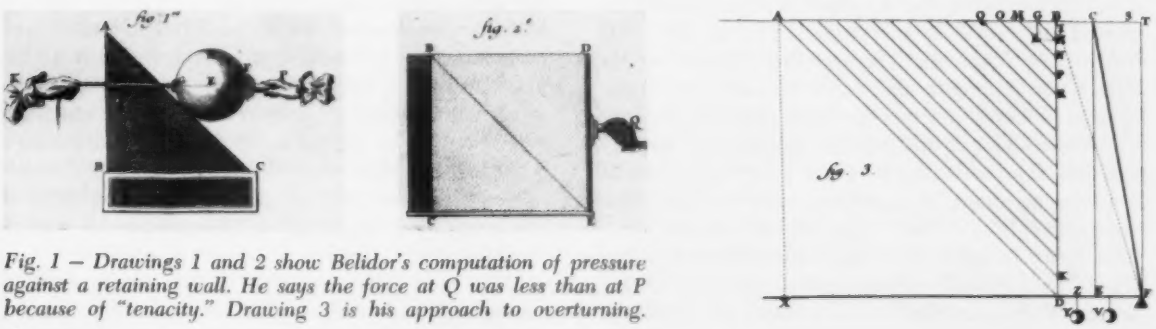


Fig. 1 — Drawings 1 and 2 show Belidor's computation of pressure against a retaining wall. He says the force at Q was less than at P because of "tenacity." Drawing 3 is his approach to overturning.

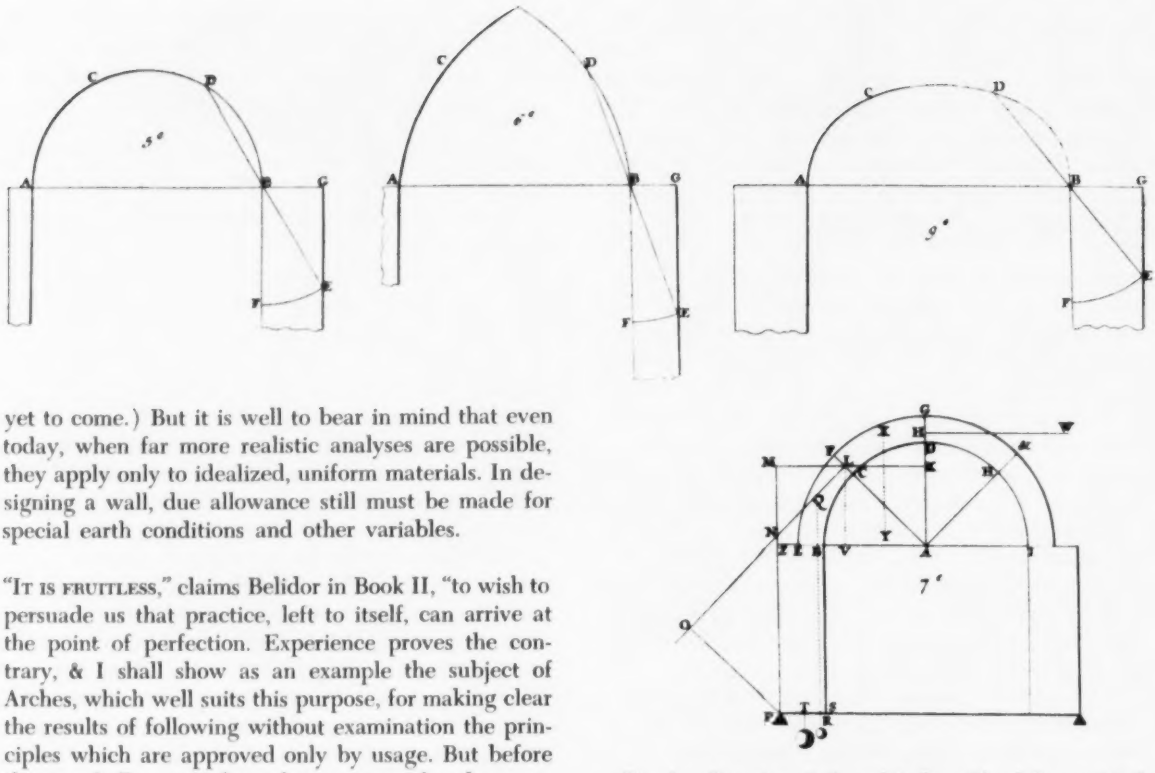


Fig. 2 — Drawings 5, 6, and 9 show Blondel's empirical rule for determining the thickness of side walls and abutments. The arch is divided by three equal chords. The extension of chord DB its own length beyond the arch determines BG, the required thickness of the abutment. Drawing 7 shows Belidor's analysis of cracked arches. Since cracking often occured at the quarter points, he concluded that the thrust of the upper quarter CFGD is balanced by the combined moments of RPZB and EFCB around outer base point P. From this he computes PR, the base necessary for equilibrium.

yet to come.) But it is well to bear in mind that even today, when far more realistic analyses are possible, they apply only to idealized, uniform materials. In designing a wall, due allowance still must be made for special earth conditions and other variables.

"IT IS FRUITLESS," claims Belidor in Book II, "to wish to persuade us that practice, left to itself, can arrive at the point of perfection. Experience proves the contrary, & I shall show as an example the subject of Arches, which well suits this purpose, for making clear the results of following without examination the principles which are approved only by usage. But before this we shall suggest how the pressure of arches acts, and then examine if the ideas which we have given are in accord with the results of practice." Unfortunately he was unable to substantiate his claims. In the end he was forced to be satisfied with tabulating arch dimensions — thickness of ring-stones, etc. — drawn from practice, and, as he admits, "without any mixture of algebra whatever."

The idea that there was a special form of arch curve which would provide a pure compression ring had occurred to earlier workers. Studies of the ideal arch curve had been made by other engineers, especially in considering the proper shape for a dome. These studies applied only to symmetrical loading. But a moving load on an arch bridge would produce unsymmetrical loading and, thus, bending in any form of arch ring. The floor of such bridges, however, was supported on a solid earth fill over the haunches of the arch, i.e., they were spandrel-filled arches, and this fill resisted any tendency of the arch ring to bow outward at the haunches. The spandrel-fill was an important but apparently unrecognized factor in the stability of arches under moving loads. Belidor does not discuss the effect of any external loading, but he suggests that if an arch ring be given the general form of of a hanging chain, "it is not necessary to follow this exact curve because we ordinarily use mortar."

He seems to have attributed the stability of arches largely to adequate mortar joints, ignoring earlier "dry built" Roman works. In discussing the action of a full-centered, circular arch ring, he observes, "If one considers an Arch . . . formed by a number of equal Voussoirs . . . cut so that their joints prolonged come to the center of the semi-circle . . . the Voussoirs . . . can be regarded as wedges which rest on & sustain one another." It is not realistic, he argues, to assume that the arch will be stable if "there is not between the Voussoirs any cement, & they have freedom to slide as their faces are polished. It is not possible that all the voussoirs which compose an Arch can support themselves without having between them Cement and Mortar, because the higher voussoirs having more of a force to push them than the inferior . . . this leaves those lower down free to fall and the arrangement of the voussoirs is destroyed & by consequence that of the Arch itself." Cement, he insists, is essential.

"The need to use mortar in the construction of masonry, & especially in that of arches for binding

the stones, makes it possible to dispense with calculating the thrust of all the voussoirs, each separately; it suffices to consider a certain number as if they constituted a single voussoir, thus avoiding the extremely long calculation we would be obliged to make if we did otherwise. Experience has shown that, when the end walls of an arch are somewhat weak to sustain its thrust, the arch cracks near the center of the haunches, that is to say, between the impost and the key. Since the weakest part of an arch is here, it is quite natural to suppose that this is the part that carries the full section of the thrust, & to consider the two parts of the arch (plate 7, Fig. 2) CG & CE as if they were composed of a single stone. . . . CG acts as a wedge which has been introduced between the two parts FA & GA to hold them apart . . . and in a sense . . . this causes all the thrust."

Turning to the problem of the necessary depth of the key stone and "of each voussoir so that it will sustain itself in equilibrium," he notes the researches of M. de la Hire on "how much to increase their depth below that of the Key, to obtain by their proper weight the force of which they have less by reason of their location." He suggests a graphical construction and then endeavors to prove it again stating that the use of mortar makes it possible in solid construction to use voussoirs of uniform depth rather than increasing their depth near the supports as La Hire requires.

Belidor recognized the importance of adequate end walls or abutments in arch design, but considered only the problem of overturning. However, many instances of arch failure in his time undoubtedly were due to the yielding of foundations under unequal pressure. He first mentions the classical analysis of Blondel, who drew three equal chords in the intrados of the arch. The extension of the side chord its own length determined the width of the abutment needed for an arch, whether round, elliptical, or pointed.

The method suggested by Belidor (Fig. 2) was based on his observation that arches generally cracked at the quarter point, or the middle of the haunches. Assuming as components the horizontal thrust at the key, the central tangential thrust at the quarter point, and the weight of the upper quarter section, he computes the thrust at the quarter point and its moment about the outer edge of the side wall. This moment he equates to the moment of the wall and its attached quarter arch, to get side wall width.

One cannot claim that more than a beginning in arch analysis had been made in Belidor's day. He apologizes for his use of algebra — limited almost entirely to moments and the triangle of forces — and advises that those who fail to follow his studies turn to his table of arch dimensions.

Book III of *La Science* covers materials of construction, "their properties, their details, & the methods of placing them in works." Here one finds descriptions of bricks, their qualities and manufacture, of lime and its slaking, of sand and pozzuolana, and of plaster and the composition of mortar. Construction in masonry also is described, and unit weights for a wide variety of materials are given — ranging from the common metals to salt and fresh water. This is followed by instructions for the organization and conduct of works and data on the movement and placing of earth. Belidor concludes with a section on foundations for edifices, especially in bad ground, and for the construction of tunnels. This book is illustrated with engravings showing work under way on a fortification and includes tables of quantities and a typical cost estimate. It is not until we reach Book IV that Belidor takes up the classical problem of beams.

Beams had been used, of course, for centuries — especially in buildings. Wood was the only material available, and there were no codes to specify floor loads per square foot. Experience had led to practical standards relating size to span under usual conditions of use. Gautier had quoted a table of sizes and spans in which La Hire had summarized past practice, but Belidor was interested in actually computing the size of wood beams required to safely sustain the loads encountered in engineering practice.

Neither Galileo, one of the first to study the mechanics of beams, nor Belidor, who wrote a century later, expressed the internal resisting moment of a rectangular beam in the modern form. Both approached the problem on what may be termed a comparative basis and, although their assumptions regarding the distribution of the fiber stress were in error, both arrived at some correct conclusions. Belidor, in fact, using data from actual tests of beams, was apparently the first to actually determine correctly the necessary depth of a rectangular beam of a given span to carry a given load.

Galileo erroneously assumed that an overhanging, cantilever beam was supported by a uniformly distributed, horizontal, purely tensional fiber stress acting over its cross section at the point of support. Belidor erroneously assumed that the stress was purely tensional, varying from a maximum at the top of the section to zero at the bottom. It was not until 1773 that another French military engineer, Coulomb, allowed for both tension and compression and solved the problem of the resisting moment correctly. Yet his work escaped notice, with the result that Navier, whose "lessons" were published in 1826, is usually given credit for what is known today as "the common theory of flexure."

Belidor, dealing with rectangular beams only, appears to have completely ignored the equilibrium requirement that the sums of the horizontal forces acting on the beam must balance out. He shows a

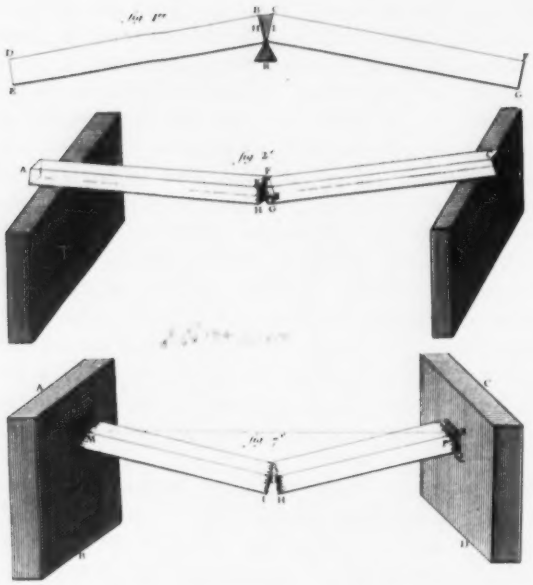


Fig. 3— Belidor believed stress on an overhanging beam (top view) to be purely tensional, varying from a maximum at the top to zero at the bottom. Similarly, he reasoned that the reverse was true for a beam supported at each end (center). For a built in beam (bottom view), Belidor assumed the effect of the load to be equally supported between the center and the supports: the stress at each point equals one-third the total load.

board (Fig. 3) supported at its center and loaded equally on each overhanging end and notes that as the load is applied "the board begins to bend a little, since the fibers at its center elongate, the one more than the other, & are extended in proportion to their distance from the point of support."

Similarly, he says the fibers of a beam supported at each end and loaded in the middle (Fig. 3) will be subjected to an elongation decreasing from a maximum at the bottom to zero at the top. He goes on to note that "if we consider the section divided into a great number of equal parts & that each point of division corresponds to a fiber, [the stressing in] the fibers is in arithmetical progression, since together they comprise the elements of a triangle." Further, since the lever arms of the fibers are similarly in arithmetical progression, the efforts of all the fibers is represented by a similar triangle. If we double the depth of a beam, keeping the same span and width, we double the number of fibers and double their lever arms and the "force" is increased four times. He concludes correctly that the resistance of two rectangular beams of equal spans but different depths is in proportion as "the product of the square of the depth of one multiplied by its width is to the product of the square of the depth of the other times its width."

THE MODERN ENGINEER, trying to follow Belidor's long and involved analyses of these basic structural forms, is apt to dismiss his pioneer efforts as generally erroneous and hopelessly confused. Yet several of his ideas were basic to the later development of more accurate analyses. It is probable that many of his statements were deliberately made long, drawn out, and somewhat repetitious, in order to meet the needs of fellow engineers who were unfamiliar with this new approach in design, and knew little of practical mathematics.

He notes the difficulties faced by those "who attempt to use mathematics as a means of perfecting the Arts . . . One makes progress," he observes, "only when he is bolder than was expected hitherto . . . there are only a small number of persons who are in a position to judge properly and to undertake this science and one has difficulty in persuading them that it is capable of all the marvels which have been attributed to it. . . . It is very true," he admits, "that experience contributes to new understandings . . . Thus, why, it is asked, do you wish to expose Architecture to more abstract understandings? Earlier Architects did not know Algebra, & their works are no less solid, no less beautiful? . . . One sees through long usage how they have been built following similar earlier works, and have provided certain practices which have been well established, but what understanding is necessary before venturing more courageously? To labor all their lives with this little sufficing reflects the unfortunate condition of men who have only begun to know some things when they have arrived at the last end of their days."

The natural science of the day also offered little of immediate value in what Belidor referred to as "the perfection" of engineering works. The observational and descriptive sciences were only beginning to take form with the development of instruments permitting more fully quantitative measurements. Yet, because they could not be treated mathematically, such sciences were too often considered unworthy of attention. On the other hand, the engineer had always been close to nature and dependent on trial and observation as a guide to practice. He naturally turned to the testing of materials and structural units. While progress was slow, theory, analysis, and testing evolved in parallel. There can, in fact, be little doubt that this essential and mutually stimulating liaison in the rise of engineering science, so evident in the work of Belidor and other early engineer-authors, aided in furthering the more objective, experimental attitude which was evolving in natural science in the 18th century throughout Western Europe.

In spite of his errors, therefore, Belidor did arrive at some useful results. In his later volumes on *Architecture hydraulique* which, he observes, "serve to supplement *La Science des ingenieurs*," he also adds some most interesting observations on mechanics, hydraulics, machines, and structures. ▲▲

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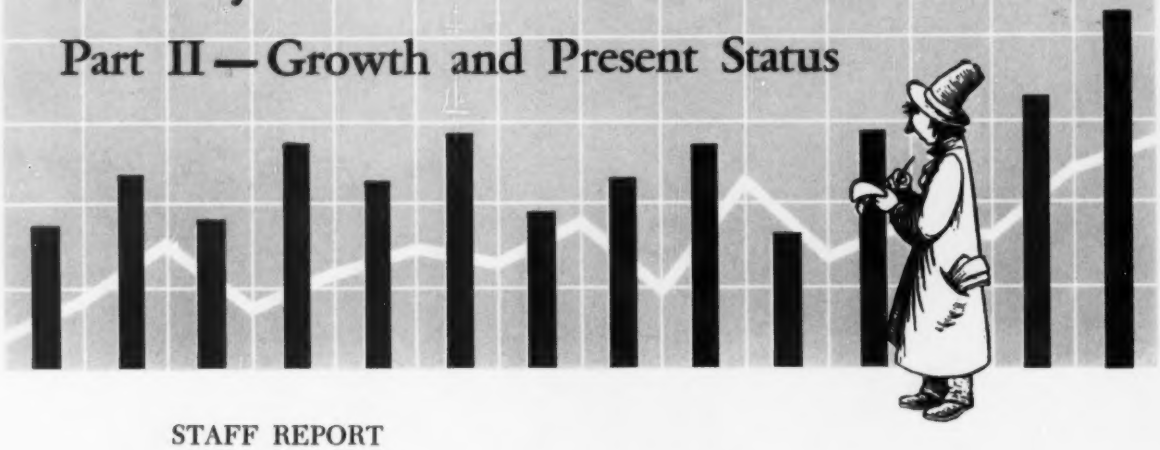
Survey Of The Profession... 1961

Part II—Growth and Present Status



STAFF REPORT

LAST MONTH, in a Staff Report, CONSULTING ENGINEER published considerable comment and a series of statistical charts based on data provided by a questionnaire sent out to readers late in 1960. This report dealt primarily with the growth of the profession during the decade of the '50s.

CE exclusive

In this follow-up report, some attention again is paid to growth and growth rates during the past decade, but most of the data and comment deal with the profession as it is today:

¶ What kind of clients does the profession serve and to what extent do they contribute to the work load?
¶ What kinds of engineering services are offered?
¶ Is the trend toward specialization or toward the general engineering firm?
¶ What nondesign services are currently being offered?
¶ What is the average firm's income, and what is the income per employee?

What Kind of Client?

A count of the returns from the survey shows that private business is the largest single client of consulting firms. The IBM cards, punched to correspond to the answers on the questionnaires, indicate that 44.7 percent of the engineering work came from private business last year.

Government work amounts to nearly a quarter of the total. Local government accounts for 14.6 percent, with the balance made up by state and Federal contracts. Actually, the Federal government should be given credit for some part of the state govern-

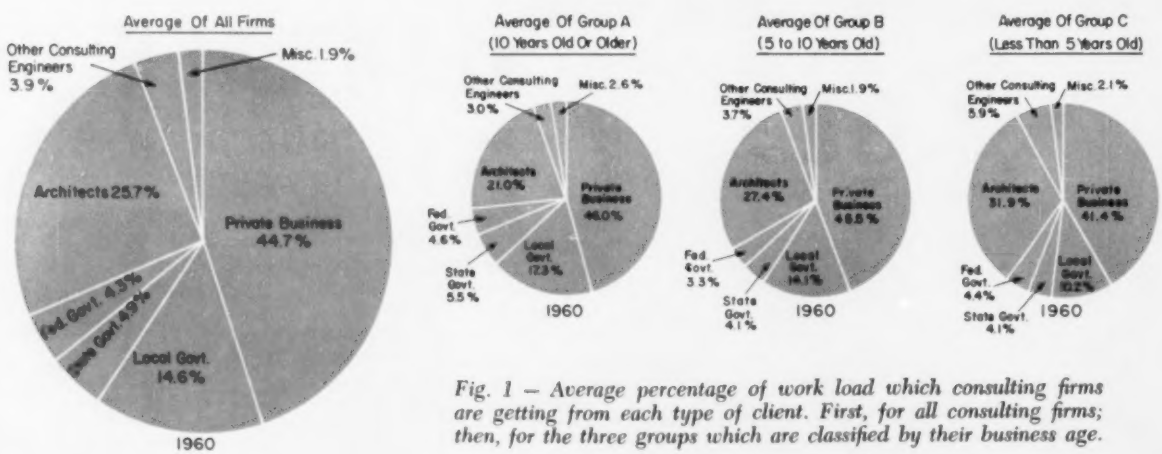
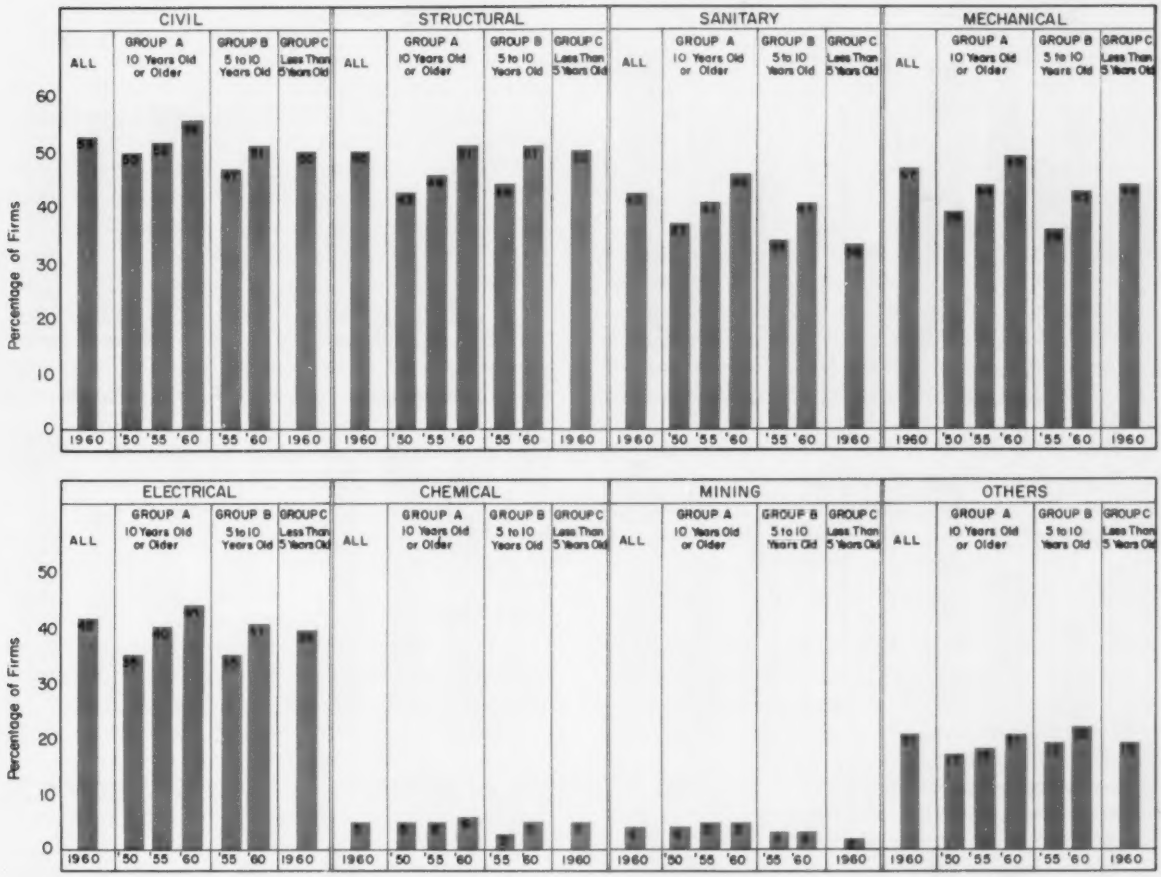


Fig. 1 — Average percentage of work load which consulting firms are getting from each type of client. First, for all consulting firms; then, for the three groups which are classified by their business age.



ment work, since much of the state work on highways and other public projects is financed to a considerable extent by Federal funds.

Slightly over a quarter of all the work done by consulting engineers is in interprofessional practice for architects (25.7 percent), with a much smaller amount (3.9 percent) done for other consulting engineers. Unhappily, it is in the work done for architects that consulting engineers have the most difficulty making ends meet. It seems reasonable that architects would want to maintain respectable levels of fees for fellow professionals, but in most parts of the country, architectural clients are the most avid shoppers for services, the most intent bargainers on a price basis, and the most persistent demanders of extra work at the same fee.

Fig. 1 shows the percentage of work from each type of client in 1960, not only for the average firm, but for three groups of firms. As last month, group A represents the firms over 10 years old. Group B is those firms founded between 1950 and 1955, and Group C is the young firms, founded since 1955. The really significant difference here is the considerably higher percentage of young firms that are in interprofessional practice with architectural clients. The fact that the older firms have much less work from architects is indicative of the poor pay for work of this type. Young firms take work from architects to stay in business during their early years, but there is a clear and decided turn toward private business and government projects as firms get older. A study of five-year-ago and ten-year-ago figures for the older groups substantiates these conclusions.

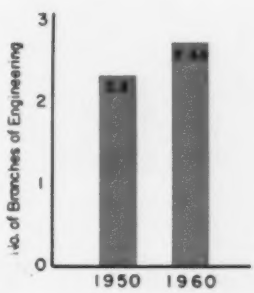


Fig. 2 — The percentage of firms offering services under a number of common categories. Note the clear trend toward diversification. Actual number of engineering branches in which services are offered has increased from 2.3 in 1950 to 2.65 in 1960, as shown at the left. These figures are based on the average of all the firms.

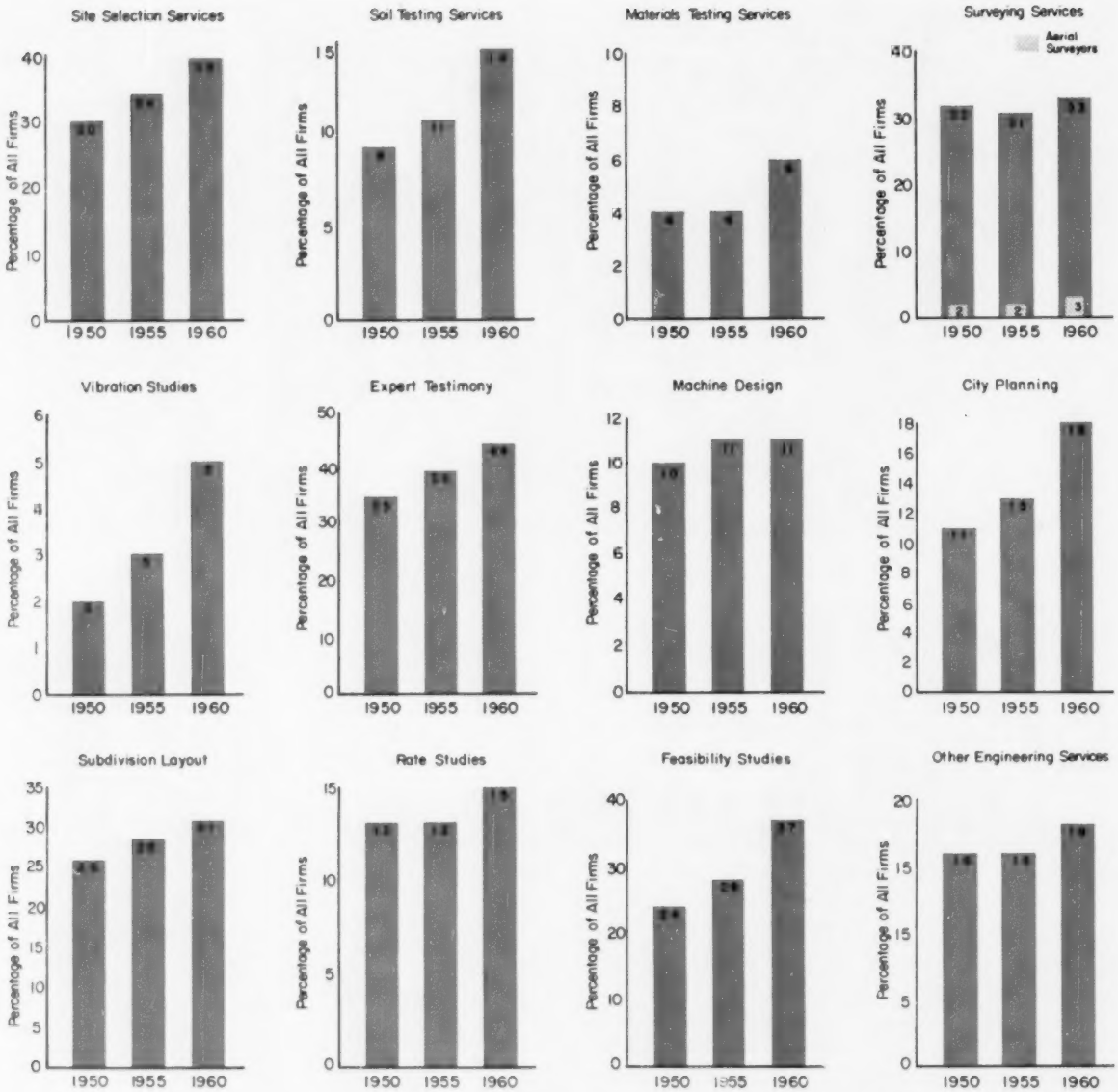
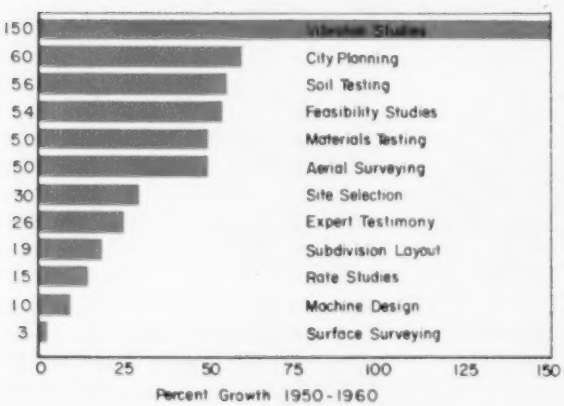


Fig. 3 — Engineering services, exclusive of design, are a growing part of the consulting firm's normal work load.



If the young firms do more work for architects, they do correspondingly less work for government and private business. Particularly noteworthy is the relatively large amount of government work done by the older firms. It would seem that the governments are conservative in their hiring of consulting engineers and demand both size and experience from the firms they engage.

Design Services Offered

Unsatisfactory as the classifications are, it is still customary to refer to engineering services according

to the categories of civil, structural, sanitary, mechanical, and electrical engineering. Fig. 2 shows that somewhere between 40 and 50 percent – just about half – of the consulting firms offer services in each of these fields. If all these percentages are added together, it turns out that the average firm offers services in 2.65 branches of engineering. This figure has increased steadily since 1950.

It is most important to understand that these data represent types of services offered, not limitations on types of equipment or kinds of material specified. In fact, there is an enormous overlap within these design services. For example, a consulting firm offering sanitary engineering services would have to specify mechanical, electrical, structural, and chemical products, and mechanical engineering always requires considerable electrical design and specification, and even some structural. The engineer offering civil services only, and concentrating in heavy engineering design, must design and specify great quantities of mechanical and electrical equipment, and obviously he must deal in structural design for the major projects he undertakes. It is almost impossible today to offer engineering services in one isolated specialty.

Clearly, the trend is toward offering more general engineering services as opposed to narrow specialty design work. Only the very small firm, the one- or two-man organization, offers just one type of service. As soon as the organization grows, it expands not only in personnel but in types of design services offered.

This trend toward a multiplicity of services is a logical one, for most clients want to deal with one engineering firm for an entire project rather than four or five separate firms who must coordinate their specialty fields. In this regard the engineering profession is turning toward the ancient ways of the architects. When a client goes to an architect he expects to have the project handled by one firm. He does not go to one architect for the church and another for the steeple.

Fig. 2 shows not only the current percentage of all firms offering each of the various types of engineering services but also expansion of the services during the past decade. Note that in every field of engineering service there has been a measurable and meaningful growth during the past 10 years. This is shown most clearly in the pattern for the older Group A, where, for example, there has been a substantial growth from 37 to 46 percent of the firms offering sanitary services, 39 to 49 percent offering mechanical, and 35 to 44 percent offering electrical. There also has been substantial growth in the percentage of firms offering structural and civil.

Neither chemical nor mining have shown significant growth patterns, but this is understandable, for relatively few independent consulting firms offer either chemical or mining engineering services. Most of the chemical design is done by large chemical construction companies, and mining, too, is now largely in the hands of great industrial enterprises. The growth from 3 to 5 percent of the firms of 5-10 year age, Group B, may be indicative, however, of a hopeful trend in chemical engineering. Surely there is no industry in more need of independent engineer-

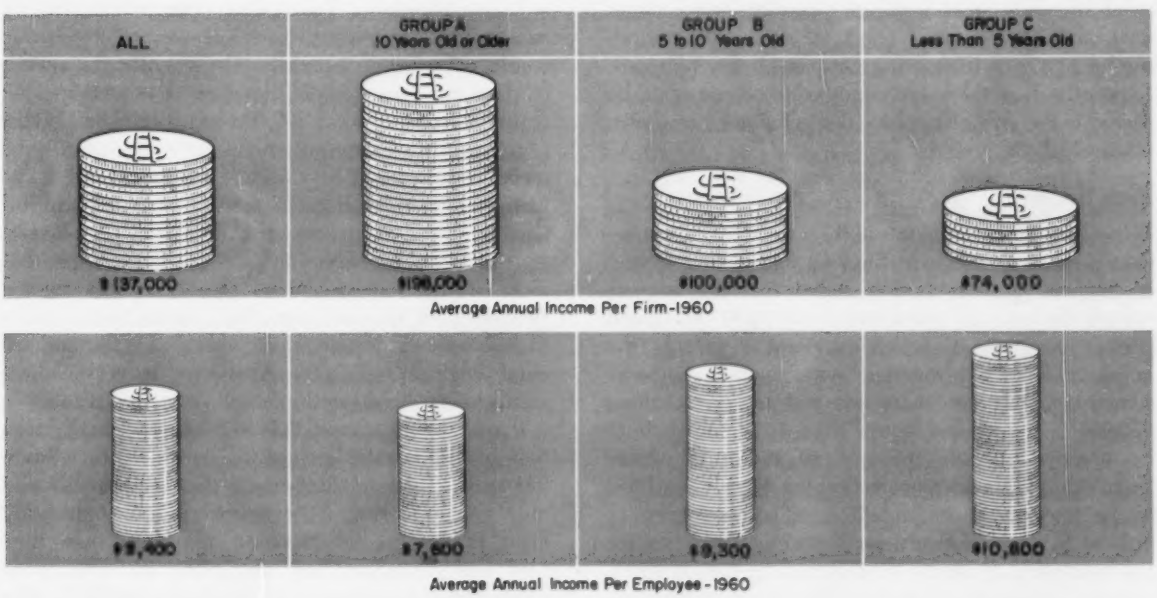


Fig. 4 – Average annual income per firm and per employee. Note low per employee figure for the older consulting firms.

ing advice than the various chemical and process industries, and the growth of this middle age group offers some hope that chemical industry clients may be better served in the future by firms without prejudicial manufacturing or contracting ties.

Nondesign Services

Few successful engineering firms have limited their activities strictly to engineering design. Almost invariably there are some affiliated nondesign services that appear to offer prospects for fun and profit. Fig. 3 illustrates the growth of a number of these miscellaneous engineering services. Most have grown rapidly during the past decade. Vibration studies have shown a magnificent growth, as have city planning, soil testing, feasibility studies, materials testing, site selection, and aerial surveying. Only conventional surveying, and perhaps machine design and rate studies, have failed to keep up with the general growth of the economy during the decade of the '50s.

A detailed study of the figures from which these charts were prepared shows some interesting relationships. For example, feasibility studies are much more popular among the new firms than the old. In contrast, old firms are taking on assignments in site selection more rapidly than new firms. As might be expected, expert testimony is reserved more for the ancients. So are rate studies.

While vibration studies show a phenomenal growth rate of 150 percent during the decade, it must be kept in mind that this is still a small field. Even today, only 5 percent of the engineering firms engage in it, and back in 1950 it was an almost insignificant 2 percent. Still, if a firm is looking for a growth investment, the addition of a vibration studies service might well be it. On the other hand, to jump on the bandwagon in a growth activity may not always be smart. It may be that there are eager clients waiting to be served in the area of machine design, which has shown relatively little growth.

Firm Income

Income is always an interesting topic. The survey data presented in January showed some bright figures of financial growth. It was stated that the average firm in the country had a net worth of $113,000, and further comment went on to point out that "the engineer who got together with another engineer something over five years ago and kicked in about $18,000 . . . now has better than $2.50 for each $1 he invested." While there is no reason to doubt these figures, the engineers heading their firms have to be fine financiers, excellent office managers, or able to live on relatively small personal incomes, for the total annual income of the average firm is small.

Fewer respondents answered the question concerning income from fees than most of the other questions, and a full analysis showed that the average firm answering has 16.4 employees. (This is less than the 21.21 employees which is the average of all firms answering the questionnaire as a whole.) The average income for this average firm was $137,000 per year, which gives a figure of $8400 per employee, as shown in Fig. 4.

An income of $8400 per employee may not sound bad to start off with, but if we assume, as consulting engineers often do, that one-half of the income must go to indirect expenses, then this would leave only $4200 per employee as pay. There would have to be a very high percentage of low pay, nontechnical employees to leave enough extra for a decent wage for the engineers and the partners. True, in a firm of this size, only slightly over three of the employees, including the partners, would be registered engineers, but there is still much to be desired concerning the amount of income that is available for use as wages.

This same Fig. 4 also shows that the older and larger firms of Group A have a higher total income than average, but an even smaller annual income per employee. This is to be expected, for as shown in the January Survey, these larger firms have a much higher percentage of low level personnel (clerks, draftsmen, and typists) than do the younger and smaller firms. Therefore, even though this figure of $7600 seems extremely low, it is proper that it should be lower for the older firms than it should be for the younger.

At the other extreme, the youngest firms (which for the group answering this particular question had an average personnel of 7, including the owners) had a per employee annual income of $10,600. This is a fairly reasonable figure; one often mentioned by successful engineering firms. However, even this would not provide a princely income for the owner or partners. For example, if we cut the total income figure in half, we have $37,000 left for wages. If this is a sole ownership, we might give $14,000 to the owner and $10,000 to his chief engineer, and leave just $13,000 to be divided among five rather pitiful and practically poverty stricken minor employees. In this particular example we can only hope that most of them are members of the owner's family. Obviously, if they are not, then it will be necessary to reduce considerably the owner's $14,000, and his chief engineer's $10,000. Any way it is sliced, it seems to be sliced too thin.

It may be, of course, that it does not actually take half of the annual income to cover indirect costs; but most successful firms insist that it does. We can only conclude that it is necessary for engineering firms to get greater incomes from fees than they now are getting if they are going to be able to support the owners and their employees properly. Professional poverty cannot be tolerated. ▲▲

Using the Exotic Sealants

RICHARD LANG
Lockwood Greene

THE RAPID DEVELOPMENT of new bulk sealing materials during the last decade has been accompanied by confusion, misinformation, and some failure of application. This has placed a burden on the consultant who is eager to use these modern materials.

CE exclusive

The older sealants have limiting characteristics which generally restrict their use to narrow fields of application. For example, the putties and vegetable oil caulking compounds harden and lose plasticity. In addition, their ability to withstand elongation is limited. The bituminous or asphaltic base joint sealants are easily attacked by most common solvents, and they soften at relatively low temperatures.

While the new sealants often overcome these drawbacks and offer other advantages, there has been a tendency on the part of some manufacturers to play down or completely obscure their limitations. Also, the new materials have been developed and marketed so rapidly that there is no broad background of testing, evaluation, and experience on which to base ratings. Thus, application problems often arise.

Origin and Use of the New Sealants

The exotic sealants are elastomeric organic polymers, generically related to the plastics and rubbers. They all are expensive, but their general characteristics include excellent bond and adhesion, good chemical and solvent resistance, long service life (about 20 years), and high elongation and resiliency. Some can withstand high temperatures.

The new sealants are identified by the name of the basic monomer or polymer of their major constituent, except in cases where compounds of varying characteristics can be made by cross-linking different molecular side groups with the same basic polymer. In use, they can be divided into two groups: the one part premixed types, which cure by solvent evaporation or oxidation; and the two part materials, which require job-site addition of an accelerator or catalyst just before use.

Presently, these sealants are used in concrete highway and runway expansion joints and construction and sealing joints in hydraulic structures such as flumes and penstocks. They also are used as sealers for metal storage tanks; for pressure sealing of aircraft and missile frames; for protection and sealing of electrical connections; for resilient mounting of small parts in electronic equipment, instruments, and optical devices; and for seals in mechanical equipment where preformed seals or gaskets are not applicable. Obviously, the engineering applications are endless.

However, the proper material must be carefully chosen for each end use.

Success and Failure

An interesting sealing problem involved the handling of effluent from a synthetic fiber plant. The effluent contained toxic by-products which could contaminate the wells of nearby farm dwellings if leakage occurred. Conventional asphaltic or bituminous base jointing compounds could not be used because the wastes also contained a wide range of acids, alkaline salts, and organic solvents, including acetic acid, nitric acid, sulphuric acid, caustic soda, sodium sulphate, ammonium nitrate, and free ammonia. Although hot poured sulphur compounds could withstand the chemical action of the effluent, they would have required an expensive continuous concrete bedding under the vitrified clay sewer line. Tests of a poly-sulphide sealant were successfully made at the owner's pilot plant, and a sewer joint was designed which was chemically resistant and completely leak proof.

When the same joint design and material were used for a chemical waste line on another smaller project, the joints failed after a few weeks of service. The wastes in the first example had been near ambient temperature; those in the second were hot. Although the manufacturer of the sealant was given detailed conditions of service, he did not state that the compound would not hold up at the elevated temperature. This manufacturer now warns against using this material for service on several of the chemicals contained in the latter waste. Unfortunately, he did not do this until the engineer and the owner had served as testing agencies for the product.

The Cost Factor

While it is true that all of the new sealants are expensive, this refers only to first cost. When an economic balance is made comparing this cost against the short life and continuing replacement cost of the older sealing materials, the new ones have a decided overall advantage in most instances.

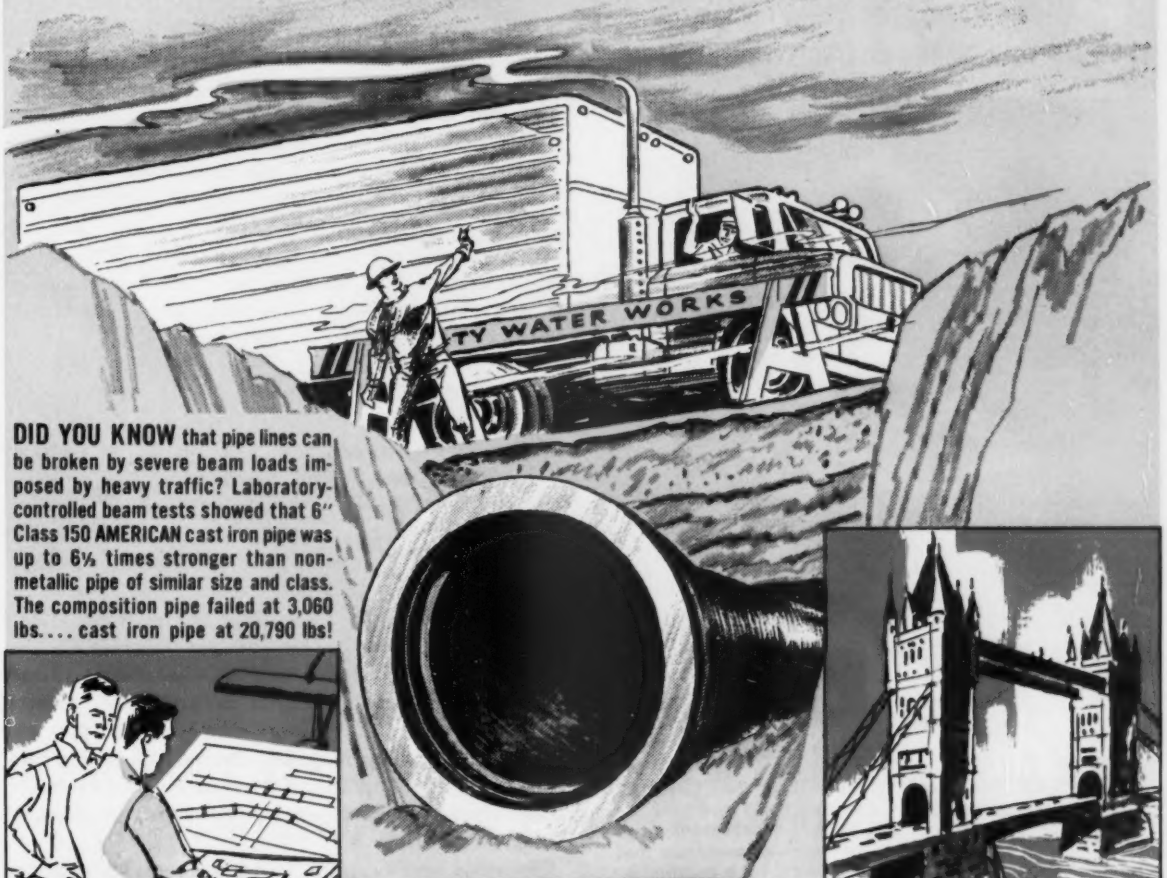
Part of the apparent high cost in using the new sealants can be blamed on waste of material and time during application. If the application personnel do not know the correct procedures, money is lost in excessive tool cleaning and unusable material. The products will harden in the can if the working time exceeds the pot life. In most cases tool cleaning calls for extraordinary solvents, such as methylethyl-ketone or zylene. This in itself is a testimonial to solvent resistance of the exotics.

Developments in Tests and Specs

Partial Federal and MIL specifications on the new bulk sealing compounds have been prepared by the General Services Administration and the various

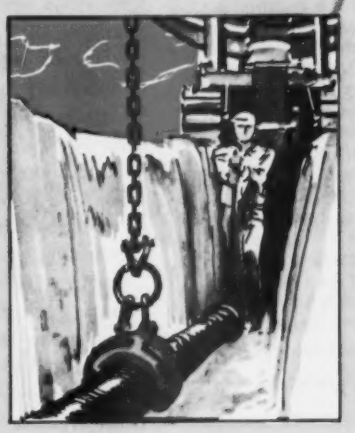
PIPE FACTS

A recent survey of hundreds of water works superintendents indicated that up to 6 to 1 preferred cast iron pipe over non-metallic substitutes.



DID YOU KNOW that pipe lines can be broken by severe beam loads imposed by heavy traffic? Laboratory-controlled beam tests showed that 6" Class 150 AMERICAN cast iron pipe was up to 6½ times stronger than non-metallic pipe of similar size and class. The composition pipe failed at 3,060 lbs.... cast iron pipe at 20,790 lbs!

DID YOU KNOW that AMERICAN cast iron pipe can be designed to withstand varying internal pressures and external loadings? Rigid A.S.A. specifications, approved by the American Water Works Association and other groups, assure water works engineers of the superior design of cast iron pipe.



DID YOU KNOW that cast iron pipe installed over 228 years ago in London, England, is still in service? And that cast iron mains installed in 1823, continue to serve New York City today? No substitute pipe can equal these authenticated records.

DID YOU KNOW that AMERICAN Fastite pipe can be assembled faster than a trencher can dig? Its exclusive, double-sealing single gasket, push-type joint is the reason why. Insert gasket ...lubricate plain end...push pipe together...and it's permanent!

AMERICAN CAST IRON PIPE COMPANY
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branches of the armed forces. The majority of these are concerned with the poly-sulphides, which are the oldest and have been used by the military services for fuel tank, air frame, and missile body pressure sealing. The American Standards Association has recently released a specification on the poly-sulphides from their Board of Review, A.S.A. A116.1-1960.

The most important work in testing, codifying, and preparing specifications on the new materials is being done by The American Society for Testing Materials. Committee C-24 on Joint Sealants has a Subcommittee on Bulk Compounds that is working on the butyls, chloroprenes, epoxys, poly-sulphides, sulfonated ethylenes, silicones and other related materials. Initially, the tests were limited to architectural uses only, but the Subcommittee, recognizing the great potential of the materials and the present chaotic situation of claims, counterclaims, and misapplications, has broadened its work to cover all potential uses.

The Consultant's Responsibility

Until the time that standards, uniform specifications, and application experience are available, the consulting engineer must feel his way very carefully. Special points to consider are:

¶ Testing – where possible test the proposed material under conditions coming as close as possible to the actual service conditions, including temperature, chemical exposure, and surface preparation.

¶ Similar projects – investigate other uses where the requirements have been similar. The sealant manufacturers are usually helpful in arranging contacts with engineers or fabricators who have had past experience with their materials. Because of earlier confusion and misapplication, the major manufacturers have done a great deal to improve testing and contractor education.

¶ Previous specifications – where specifications are available they should be used. This is particularly important on open spec bidding, where manufacturers of inferior products qualify on weak specifications.

¶ Care in detailing – details and designs incorporating the new sealants should be developed very carefully, to compensate for any known peculiarities of the materials. If possible, the details should be reviewed in advance with the sealant manufacturer, fabricator, production group, or contractor.

¶ Application specifications – the engineer's responsibility does not stop with the selection of a material and the development of a design. In using the exotic materials, his specifications should cover all cases where inexperience or unfamiliarity on the part of fabrication or production people could possibly cause failure. This might be brushed off as the responsibility of the contractor, but the engineer can serve his client's best interest by a small amount of additional care in anticipating problems. ▲▲

Stereo sound reproduction and reinforcement, private internal telephone communications plus a complete paging network are combined in a single system at the new Utica Memorial Auditorium, Utica, New York. Architects: Gehran & Seltzer of New York City. Associate Architect: Frank C. Delle Cese of Utica. Consulting Engineers: New York City office of Fred S. Dubin Associates. Installation by W. G. Brown Sound Equipment Corp., Syracuse, N. Y.

DESIGNING A VERSATILE SOUND SYSTEM LIKE THIS IS SO MUCH EASIER WITH STROMBERG-CARLSON MATCHED COMPONENTS

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Stromberg-Carlson is the *only* audio manufacturer who can offer a complete, versatile line of components—from telephone and loudspeaker intercom system to stereo high-fidelity auditorium equipment.

For detailed information on how you can offer your clients significant savings in design time, installation and cost with Stromberg-Carlson "Custom Engineered" Communications Systems, call your local Stromberg-Carlson Communications Consultant. For his name, call Western Union Operator 25, or write:

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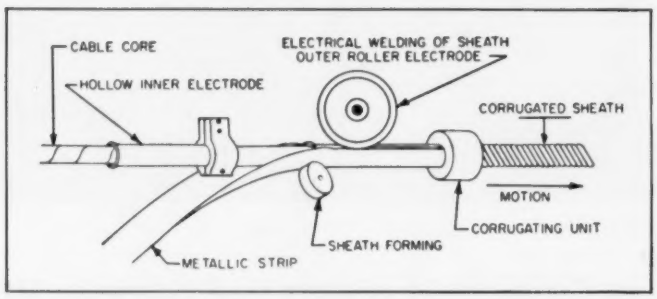
Simplex C-L-X is a packaged combination of cable and a pliable, corrugated metal sheath that's impervious to liquids and gases. It requires no separate duct or conduit regardless of environment. It is available with sheaths of steel, copper, or aluminum with or without plastic jacketing.

C-L-X is manufactured by a unique, continuous process as shown in the sketch below.

C-L-X has the imperviousness of lead, the strength of conduit, and the pliability of a non-sheathed cable. No other system compares with C-L-X.



What C-L-X Does

Cuts Installation Costs

A Southeastern utility company needed a second feeder when the load capability of one of its substations was doubled.

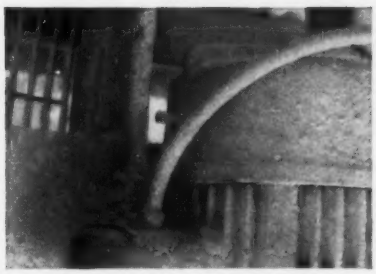
For reasons of economy they wanted a cable which would be used in a single length for both underground and aerial use. 3-conductor 500 MCM polyethylene-insulated, shielded 15KV C-L-X with polyethylene jacket was selected.

The route for the installation called for about 240 feet directly buried in the substation property with four 90-degree bends and one 45-degree bend from pothead to riser pole. The corrugated metallic sheath offered both mechanical protection and the necessary pliability for installation. A 705-foot aerial section called for a 5-degree sweep and a 30-degree bend near the pothead on the field end of the cable.

C-L-X was installed as a single length for both buried and aerial sections. The buried section was laid in a 3-foot deep trench with a 3-inch layer of sand above and below the cable.

A utility engineer states "only 2½ days were required for the installation of the cable, exclusive of splicing." A saving of more than $20,000.00 was realized by using C-L-X instead of a complete underground duct system. The carrying charges saved by this plan will pay for the present feeder in about three years.

Sealed Cable Systems Can do so many Jobs So Well



Resists Chemical Attack

This company had a corrosion problem with the electrical system in its calcium chloride reclamation building. Due to the highly corrosive atmosphere of the building, conduit life was only 6 to 9 months. The conduit was replaced with a C-L-X cable system. Now, after two years of operation, the C-L-X system is still performing perfectly, shows no signs of deterioration.

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An oil refining plant was faced with an unusually difficult wiring installation involving both power and control.

After examining every usable cable, refinery engineers selected C-L-X because it met the following requirements: (1) C-L-X could be made explosion-proof with the use of proper terminators. (2) C-L-X could be made in a continuous run for the lengths required, regardless of diameter. (3) The bending radii of C-L-X cables were sufficiently small to allow them to snake through a jungle of existing pipes.

Protects Against Liquids and Gases

An East Coast petroleum tank farm needed power and control wiring from a control panel to a series of motors used to circulate high octane fuel. Since an underground installation was desired, and the ground was saturated with oil, gas and water, it was imperative that the cable be completely liquid-tight and gas-tight.

A C-L-X 8-conductor cable protected with PVC solved the problem perfectly. In addition, installation cost was far lower than that of unprotected cables pulled into conduit.

What C-L-X Can Do for You

Whenever you're faced with a difficult installation of power, communications or control cables — or combinations — remember this important fact: ***Only Simplex C-L-X cable systems offer you all of these advantages... Exceptional Strength... Unequalled Pliability... Protection from Liquids and Gases... Faster Installation.***

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The Case for Corporate Practice

E. MONTFORD FUCIK, Harza Engineering Company

THE LEGAL ASPECT columns in the October and November issues of CONSULTING ENGINEER apparently conclude that corporate practice of engineering should be frowned upon and that the formation of limited partnerships should be encouraged in place of corporations. I believe these articles overlooked a number of important factors concerning corporate practice.

Dr. Nord introduced his subject by referring to recent action of the Committee on Model Law Revision of the National Council of State Boards of Engineering Examiners. The draft of the proposed revisions of the Model Law contained certain provisions which would permit engineers to practice through a partnership, joint stock company, or corporation, as agents, employees, officers, or partners. Dr. Nord attempted to make a case against such a proposition in the Model Law. His case against the corporate practice of engineering rests entirely upon two points: first, corporate practice insulates the engineer from personal liability for his professional conduct, and second, it prevents him from having a personal fiduciary relationship, or position of trust with the client.

It is fundamental to note that the registration laws of the 50 states are not concerned with the points raised by Dr. Nord. The opening section of all of the registration laws states the purpose of the law as follows:

> "In order to safeguard life, health, and property, any person in either public or private capacity practicing or offering to practice engineering or land surveying shall be required to submit evidence that he is qualified so to practice and shall be registered as hereafter provided . . ."

It is clearly indicated that the purposes of the registration laws are solely to safeguard life, health, and property. Also, the law is written to protect the public from unsafe engineering, not to clarify the engineer's relationship with his client or with other engineers. Therefore, any discussion of corporate practice of engineering, with reference to the registration laws, should concern itself with the proposition that corporations either can or cannot satisfactorily provide engineering services which safeguard life, health, and property. Any other considerations are totally irrelevant.

Engineering has been carried out by Stone & Webster, Chas. T. Main, Ebasco, and other large engineering corporations for at least a half century. I am sure that the record of the engineering performance of these corporations in safeguarding life, health, and property is equal, if not superior, to that of any other engineering group which has been practicing for that long. I believe a review of the records of performance of structures designed by large engineering corporations would reveal that these structures have performed with outstanding success.

In referring to corporate practice of engineering, the proposed Model Law requires that "all final plans, designs, drawings, specifications, and reports involving engineering judgment and discretion, when is-

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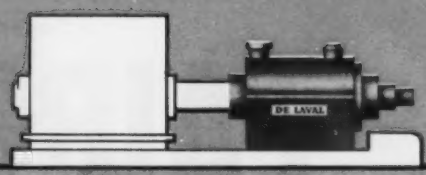
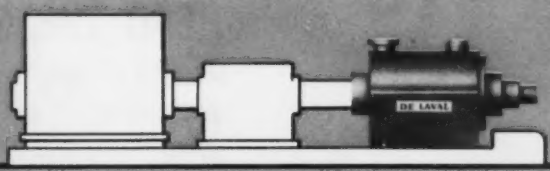
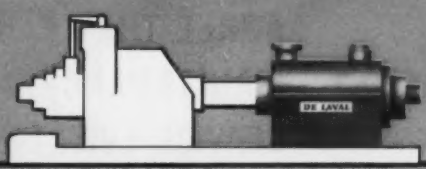


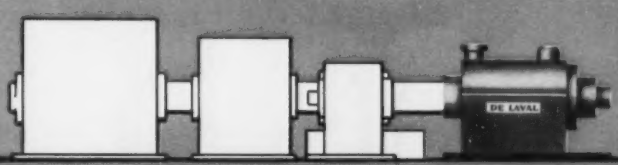
Motor-Hydraulic Coupling Drive
Commonwealth Edison Co.
5000 HP 325 MW



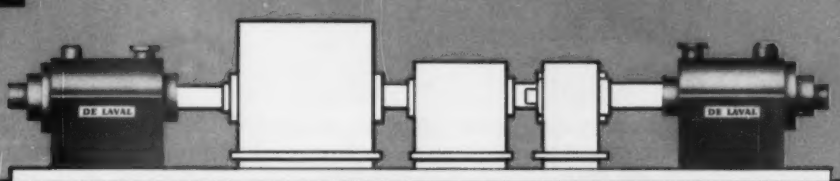
Turbine Drive
United States Steel Corporation
1400 HP 44 MW



Motor-Magnetic Coupling—Gear Drive
South Carolina Electric & Gas Co.
2500 HP 5100 RPM
125 MW

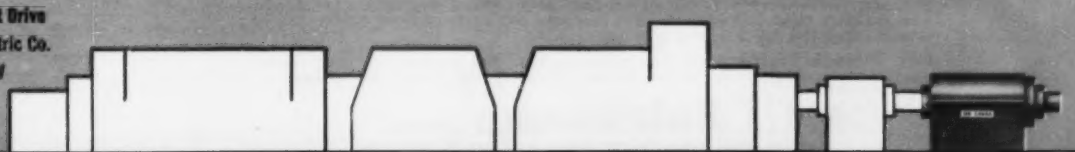


Supercritical Cycle
American Electric Power System
4000 HP 6500 RPM 5500 PSIG 120 MW



Main Generator-Shaft Drive
Commonwealth Edison Co.
4900 HP 325 MW
(FUTURE UNIT)

Main Turbine-Shaft Drive
Pacific Gas & Electric Co.
5250 HP 330 MW



DE LAVAL STEAM TURBINE COMPANY
894 NOTTINGHAM WAY, TRENTON 2, N. J.

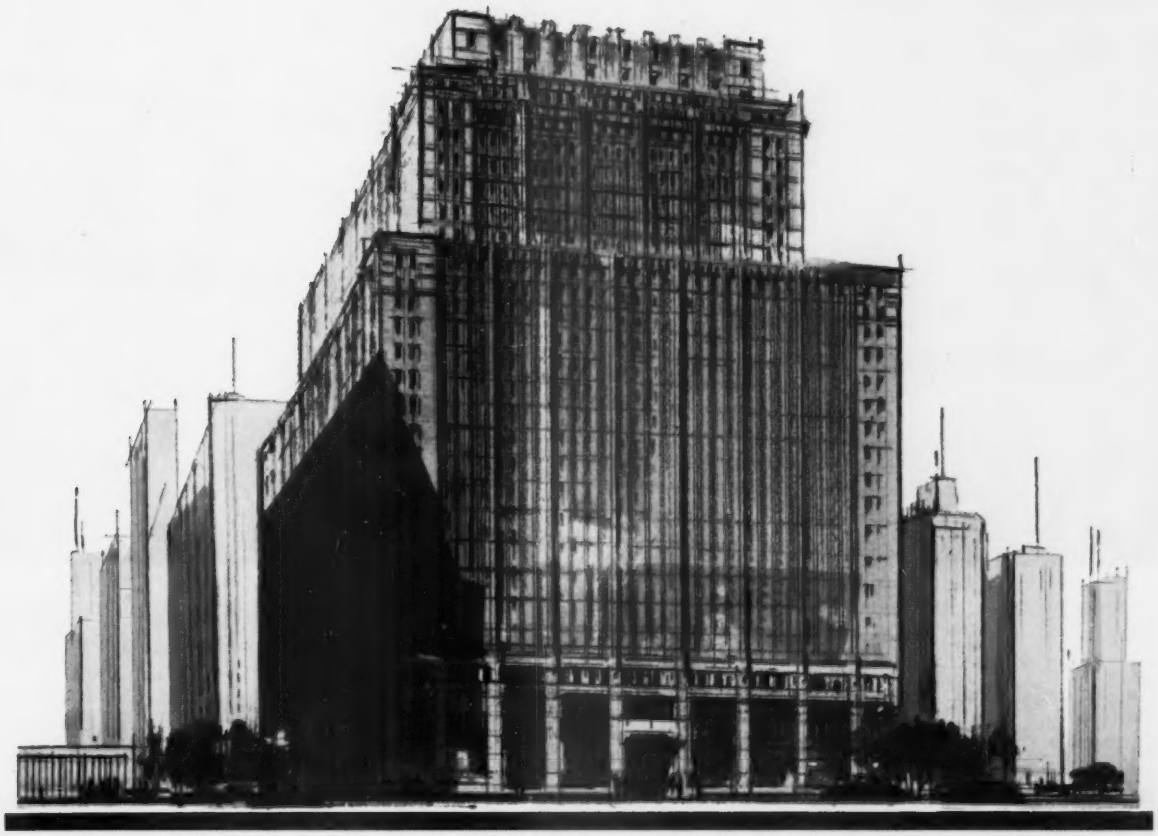
DL-227

sued, shall be dated and bear the seals and signatures of the engineers who prepared them." Other provisions of the law make it clear that the clause "engineers who prepared them" refers to registered engineers. As a result, all final plans and designs must bear the seal of a licensed engineer, whether prepared by an engineer employed by a corporation, individual, or partnership. Since registration requires proof of competency on the part of the applicant, it must be assumed that all registered engineers are competent to "safeguard life, health, and property" under the meaning of the Registration Law. Therefore, the question of what type of business organization a registered engineer is employed by has no significance in determining whether or not the purposes of the Registration Law are being upheld.

It is true that some states now have laws which prevent the practice of engineering by corporations. I have not been able to find any evidence that this was done to "safeguard life, health, and property." On the contrary, I believe that the main effort to exclude corporate practice came from, and is still coming from, groups of individuals who are afraid that engineering corporations will jeopardize their incomes, by taking business away from them. The question of safeguarding life, health, and property is studiously avoided by these groups.

I believe that the engineering profession must be extremely careful not to "mix metaphors" when discussing the problem of corporate practice for engineers. It is my opinion that the problem of corporate practice should be discussed within the framework of the registration laws of the several states. Since all of these laws are concerned only with protection of the public, we should not confuse the issue of corporate practice by bringing in other factors which are irrelevant. ▲▲

Climate by Chrysler



2 Park Avenue, New York City. Consulting Engineers: Sears and Kopf; Mechanical Contractor: Kennedy-Scheidel-Young, Inc.; Electrical Contractor: Theodore Kaleh, Inc.

Chrysler Air Conditioning tailored to tenant needs installed a floor at a time in 27-story building

During the past five years, scores of Chrysler air conditioners have been installed at 2 Park Avenue, New York City. What has been one of the longest air conditioning jobs in history has also been one of the most successful.

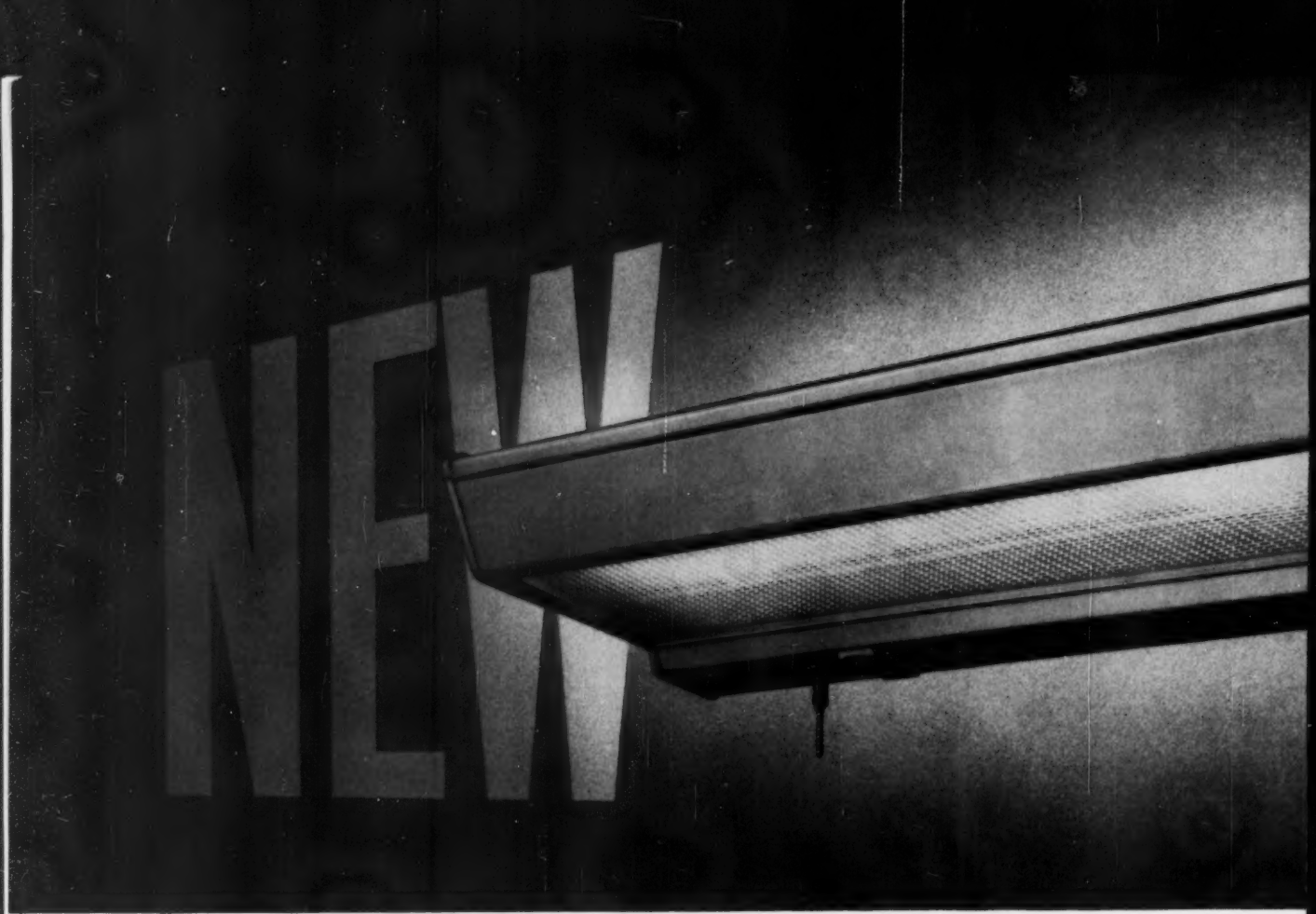
By handling this 27-story building zone by zone and floor by floor, about 1400 tons of Chrysler equipment have been installed . . . with an absolute minimum of inconvenience to tenants. As tenants move in or renew leases, they are consulted as to exact air conditioning requirements. Each then gets the system best suited to his needs.

This unusual method is flexible—Chrysler can supply packaged units, chillers or room units as needs demand. And it is economical—all air conditioning equipment taps into central electrical, water and air connections which serve the entire building.

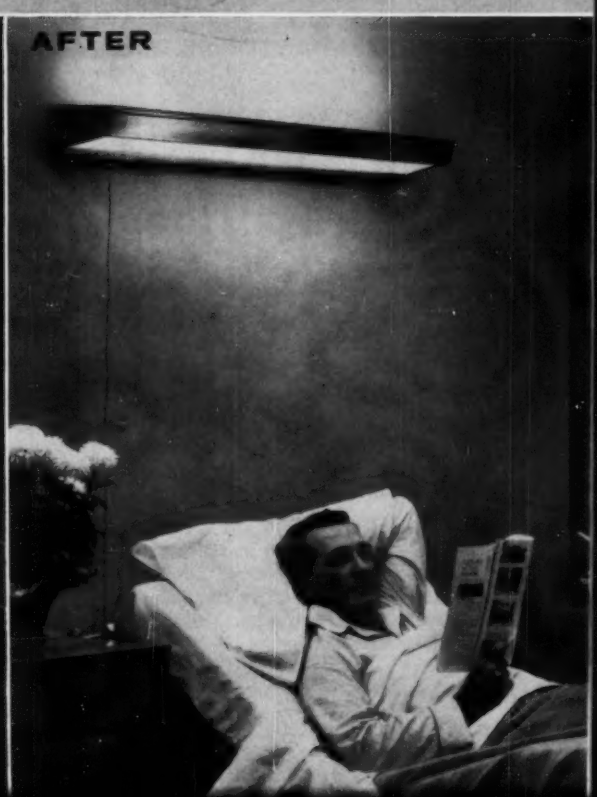
Chrysler engineers worked closely with the consulting engineer and contractor during the advance planning of this complex air conditioning problem. They will be as happy to cooperate with you. For information on their services and Chrysler Air Conditioning equipment, write today.

CHRYSLER
AIRTEMP

Airtemp Division, Chrysler Corporation, Dept. AS-21, Dayton 1, Ohio
In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario



See the difference TRANQUILITE makes in transforming a cold, harshly-lighted hospital room into an attractive, modern setting. Patients look better, see better . . . even feel better!



TRANQUILITE ...a "Decidedly Better" Hospital Bed Light by DAY-BRITE

- Switching provides reading light, night light and general illumination
- Convenient electric outlet for examining light, electric razor or radio
- No annoying glare . . . ideal for multiple-patient rooms and wards
- Available in 2 or 4-foot lengths, stainless steel or baked white enamel finish

First time you see it you'll know that here's a behind-the-bed fluorescent hospital fixture worthy of the Day-Brite name—with the clean lines and quality look you expect from America's first name in lighting equipment.

But only when you have seen it **in action** can you fully appreciate what an amazing difference TRANQUILITE makes. Cold, clinical-looking hospital rooms take on new warmth . . . become more inviting. In older rooms, TRANQUILITE's soft illumination hides defects . . . adds a modern touch.

TRANQUILITE is just one of a complete line of "Decidedly Better" Day-Brite fixtures for every hospital need. All are/**easy to install/ easy to clean/easy to maintain.** Get the full story from your Day-Brite representative, or write: **Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.**

DAY-BRITE®

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

"Quote . . . End Quote"

What It Really Says

"Every engineer is besieged with literature written to influence him to buy. Since engineers are pretty darn smart and can't be fooled, the literature is basically honest and factual. However, many popular words are used in technical sales literature out of context with their normally accepted definitions. It is well to know the technical meanings of these favorite words. Here are some that you may run across.

¶ *All New* — parts are not interchangeable with existing units.

¶ *New addition to the line* — a customer demanded a refinement.

¶ *Dependable* — if it ever breaks down you can be sure that it will be early some Sunday morning shortly after you go to bed to sleep off a big night.

¶ *Most dependable* — you can be sure when a breakdown occurs that the needed parts won't be in stock or readily available.

¶ *Design simplicity* — manufacturing costs have been cut to the bone.

¶ *New, dynamic principle* — found in every college textbook but not generally acquired knowledge.

¶ *Rugged* — too heavy to be carried by the advertising manager.

¶ *Advanced design* — beyond the comprehension of the advertising agency's copy writers.

¶ *Special design* — all the preferred designs were already patented.

¶ *Improved design* — some more bugs have been worked out.

¶ *Easily installed* — you don't have to be a graduate engineer.

¶ *Easy maintenance* — it would be easier if you had degrees in mechanical, electrical, and civil engineering.

¶ *Self-contained* — shipped without installation instructions.

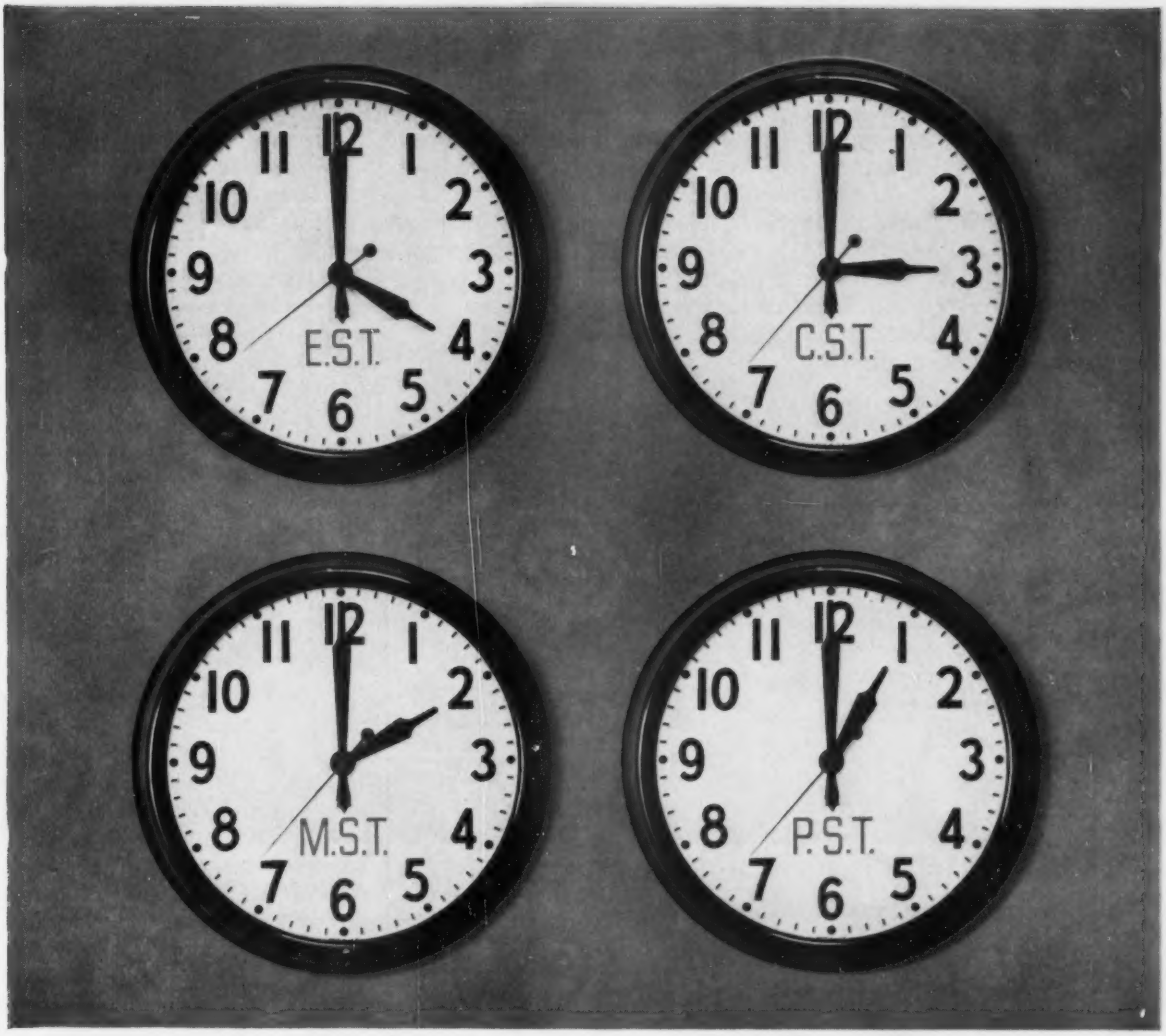
¶ *Built-in, oil-enclosed gear box* — it has a gear box that must be filled with oil. The box itself encloses the oil and not vice versa.

¶ *Wide range of sizes* — number of different models is limited but this phrase is used to solicit inquiries."

— A collection from the Milton Roy Company publication *Milton Roy Engineering Briefs.*

Free Engineering

"The American Society of Mechanical Engineers is in a position to make a unique contribution toward eliminating the major abuses of free engineering. The officers, directors, and the most active and influential members of ASME come from the top management of utilities, of companies manufacturing



ONLY MORTON OFFERS A COAST-TO-COAST SALT SERVICE FOR EVERY WATER CONDITIONING NEED!

Wherever your plant is located, whatever salt you need and whenever you need it, Morton, America's only nation-wide salt company, can provide you with the kind of salt and service to keep your brinemaking equipment working at top efficiency!

MORTON PUREX is a quality controlled evaporated grade of salt that is 100% soluble. Purex dissolves rapidly and uniformly, producing a clear, fully saturated brine at highest possible flow rates.

MORTON '999' is a high-purity evaporated salt. It is particularly suitable for use in de-alkylizing units.

MORTON ROCK SALT is economical to use and comes from many sources in a wide range of particle sizes. Morton can supply the grade best suited to your needs.

Mail coupon today for more information about the various grades of salt and the valuable service Morton offers the Water Conditioning Industry.

Please send me additional information on

_____
(type of salt)

I would also like technical help concerning

_____
(type of water conditioning problem)

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

MORTON SALT COMPANY

INDUSTRIAL DIVISION

Dept. CE 2. 110 N. Wacker Drive, Chicago 6, Ill.

technical equipment and machinery, of engineering consultants, and of contractors. These are exactly the leaders, the executives, of the different kinds of organizations who first must admit to the worst of the abuses of free engineering and, second, must decide to do something about it. These men are already banded together in our society; by their very membership in ASME they are committed to certain professional principles which are the antithesis of some of the fundamentals of free engineering. Further, these men have great influence in industry and in their communities. Hence, they could contribute immeasurably to the education and enlightenment of present and potential customers and clients, which is, of course, a necessary corollary to coordinated action regarding free engineering.

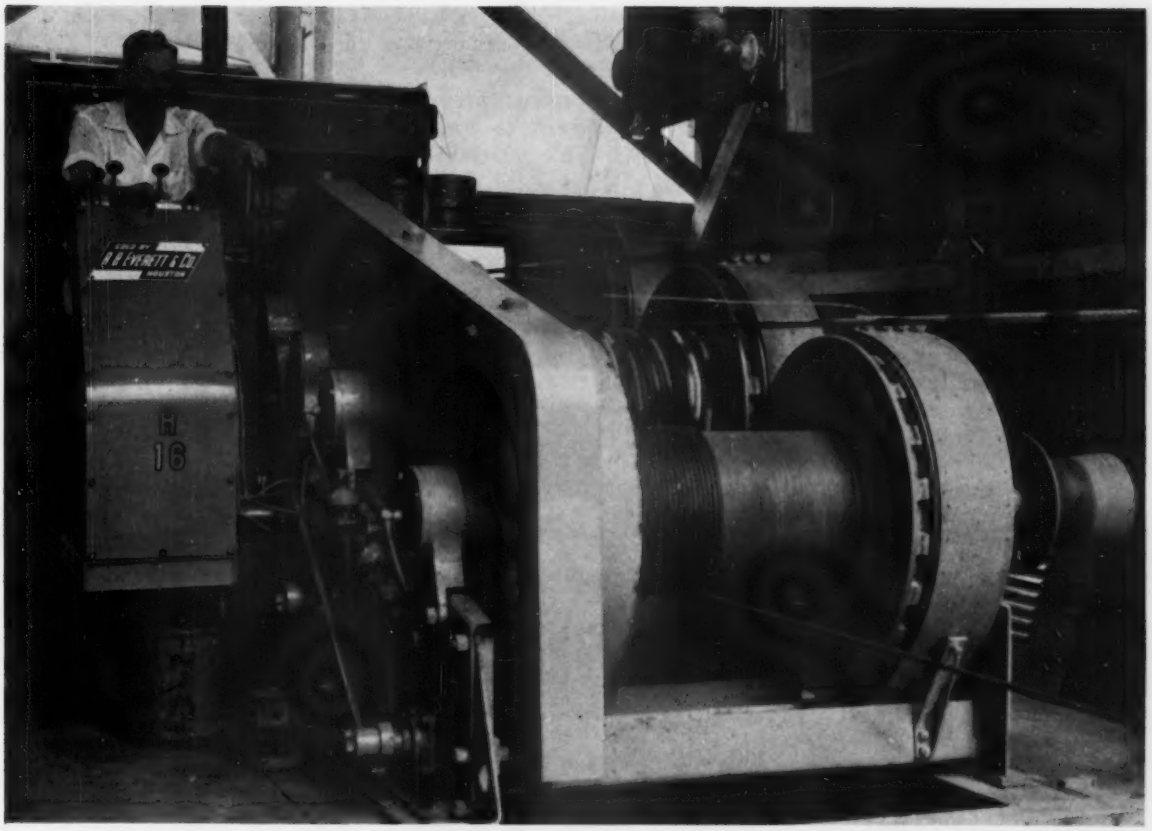
"I therefore suggest that ASME consider the appointment of a special committee of ASME members, consisting of one or two top-level managers or executives from utilities, from appropriate manufacturers, from contractors, and from consultants. The purpose of the committee would be to consider the extent of and problems relating to free engineering and to make specific recommendations for a definite course of remedial action in these regards. An agenda for this committee should be prepared by the Professional Practice Committee along with its recommendations, many of which could spring from this meeting today, as well as from a similar panel discussion held at the semiannual meeting of the ASME at Dallas earlier this year." — John G. Hoad at the *ASME Winter Annual Meeting.*

Rulings on Corporate Practice

"In Texas, where corporate practice is legal, the Attorney General ruled that the name of the Dalton, Hinds & O'Brien Engineering Company was legal even though neither Dalton, Hinds, nor O'Brien is a registered engineer. The Texas registration board had claimed that the name implied that the three are registered.

"The Attorney General ruled, however, that as long as the company's actual engineering work is done by registered engineers, the company's name is legal and does not violate the state law prohibiting unlicensed persons from using 'any title or description tending to convey the impression that he is a professional engineer . . .'

"The Attorney General also overruled the Board's contention that the Business Corporation Act of Texas should prevent the firm from practicing engineering. The Business Corporation Act specifies that no corporation may engage in a business requiring a license if state law prohibits a corporation from holding such a license. In his ruling the Attorney General pointed out that the Texas registration law specifically allows the corporate



with Safety and Accuracy . . .

Clyde Hoist makes "deposits" at Houston's First City National Bank

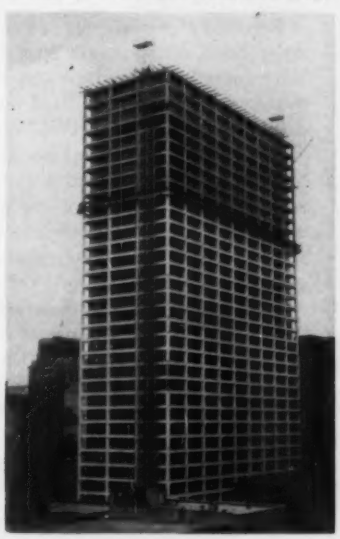
A major portion of the construction materials 'deposited' in the First City National Bank were speedily spotted with this Clyde Frame-6 Hoist . . . hoists noted around the world for dependable, efficient service.

Clyde's reputation is born of many 'plus' features that permit operator to hoist and spot loads with ease and accuracy. Large diameter, extra-capacity brakes handle maximum loads by light toe action. Clyde's internal expanding, band friction clutches give smoother, more positive full-load service.

Comparison of construction features shows why Clyde Hoists have had a reputation for superiority for more than half a century! All steel bed and side frames, high strength spur gears, anti-friction bearings throughout are but a few of the many extra values built into all Clyde Hoists . . . from 3,000 to 80,000 pounds line pull.

There is a Clyde Hoist to fit your requirements . . . to exceed your expectations! Send for Hoist Bulletin 34.

The 32 story First City National Bank adds an impressive landmark to the Houston skyline. Contractor: W. S. Bellows Construction Corp.



CLYDE

A SUBSIDIARY OF RIC

CLYDE IRON WORKS, Inc.

Established 1899

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HOISTS : DERRICKS : WHIRLEYS : BUILDERS TOWERS
UNLOADERS : CAR PULLERS : ROLLERS

practice of engineering so long as registered engineers actually do the work and that in the case of engineering, a corporation does not require a license.

"In Ohio the state Supreme Court held that a 1943 statute prohibiting the corporate practice of engineering does not affect a corporation formed for that purpose before 1943.

". . . The 1943 amendment to the registration law prohibits the corporate practice of engineering, but includes the wording, '. . . nor shall any corporation *hereafter formed* (be allowed to practice engineering.)' This amendment, the Court said, provided in effect a 'grandfather' clause, permitting corporations formed before that time to continue their practice of the profession." — *Private Practice News*, published by the NSPE Functional Section for Engineers in Private Practice.

The Water Crisis

"One flaw in the book: in dealing with the currently controversial Feather River Water Supply Program for Southern California, the authors devote considerable space to the development of 'decision formulas' and 'the present-value rule;' however, these procedures were highly misleading and contributed to the drawing of false conclusions. A state's economy and credit position could, in time, be severely damaged by the arbitrary pricing of water . . .

"The 'molding' of a proposed project to its optimum form calls for repeated trials and application of a wide range of factors. These include hydrology, topography, geology, structural design, economics, population trends, law, the rights of others, ideology, and financial resources. This is a 'sculpturing' process for which there are no short cuts. The authors, as economists, have not examined the engineering aspects of the problem as thoroughly as might be desired, but they have done a masterful job of sound economic analysis." — Adolph J. Ackerman, in a review of *Water Supply: Economics, Technology and Policy* for the *National Review*.

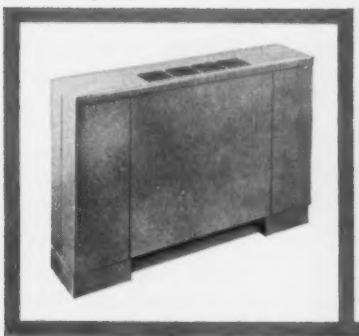
The Artist Engineer

"If engineering is to come fully into its own as a profession, engineers and the public will have to take the artist engineer more seriously. If educators don't produce more artist engineers, the nation will end up with a population of brilliant scientists, and libraries full of research reports, but nobody who can put these reports to use. A well known Detroit manufacturer makes chassis for satellites. He has witnessed many an American fizzle at Cape Canaveral. He has declared in public that, as far as he can make out, the satellites have not failed because American

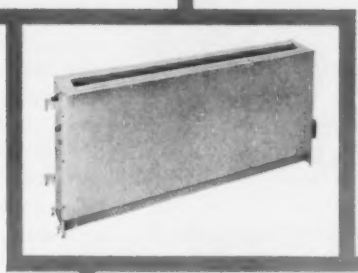
C'EST SI BON...

BOHN-AIRE

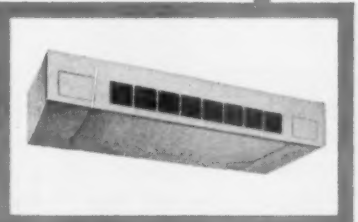
means COMFORT
in any language...
in any season!



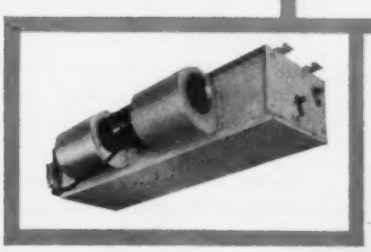
MODEL B-D for vertical floor mounting "in-the-space" or semi-recessed up to 3½".



MODEL B-V for vertical concealed floor mounting.



MODEL B-C with finished cabinet for "in-the-space" horizontal mounting.



MODEL B-H for horizontal mounting in concealed locations (plenum optional).

COMPLETE FLEXIBILITY... 4 ROOM CONDITIONERS IN 5 SIZES EACH

Quietly, dependably, BOHN-AIRE Remote Individual Room Conditioners provide year 'round comfort in apartments, motels, hotels, offices, hospitals... in any building with a central hydronic heating and cooling system. They are extremely compact with a slim 8½" width... available in concealed models or in attractive, durable cabinet styles... easy to install and service. Finger-tip push button control! Many optional accessories.

BOHN *Buy the known line... the BOHN line*
ALUMINUM & BRASS CORPORATION
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science is deficient; they have failed because American engineering arts are inferior to Russian engineering arts." – Clement J. Freund, Dean, College of Engineering, University of Detroit, at the *ASME Winter Annual Meeting*.

Finding Engineers

"Recently, Equity Advertising Agency, Inc., which specializes in professional recruitment advertising, conducted a research project based on the established circumstance that when an engineer or scientist seeks a new affiliation, he frequently is in touch with many companies simultaneously.

"For several months, Equity's research department scanned major newspapers and technical journals for recruitment advertising. After a winnowing process, 100 company advertisements were chosen. The agency replied to the advertisements by sending out 100 individually typed resumes along with the same number of covering letters. The resume was that of an imaginary engineer applicant. It stated that he had about nine years' professional experience, had worked for only one company since graduation, possessed a master's degree, and was presently employed at the group leader level in advanced research . . .

"The covering letter requested that an interested company respond by mail, since the applicant traveled frequently and would not always be able to answer a telephone call [from prospective employers].

¶ Of the 85 replies received, more than half arrived a week or more later. Telegram replies were sent by 17 companies, airmail was used by 8, first class by 58, and one large firm mailed a form post card.

¶ About 18 percent of the replying organizations used form letters. One company said that it was doing so in the interest of expediency.

¶ Misspellings and grammatical errors were common. At least 10 letters were signed by secretaries. One letter was not signed at all. Stamped return envelopes were enclosed in 22 of the replies.

¶ Some companies sent recruitment brochures. There were 16 of these, ranging from simple black and white folders to elaborate four color pamphlets running to 44 pages. Four organizations included reprinted articles from newspapers and technical journals. Three contained annual or semiannual reports; three had reprints of advertisements; three had security clearance forms; two had college transcript release forms; and two had printed material about the company's products.

¶ Only 2 of the answering companies sent printed material concerning their locations and the advantages of living and working there. Five companies detailed the extra-salary benefits offered.

¶ The most elaborate package en-

In $27-million project, trucks pounded test pavements night and day for two years

1.1 million load applications pound test pavements!

Sponsored by the American Association of State Highway Officals (AASHO), this great test will influence pavement design for years to come.

Never has there been a pavement study of such scope. On November 30th, near Ottawa, Illinois, the last trucks made their final runs—to complete the most exhaustive "in-use" testing ever given to pavements.

There were 5 test traffic loops. Each provided a range of representative concrete and asphalt pavement sections. These were pounded over and over by trucks of specified weight rolling at a steady 35 mph. At the end of two years of traffic, every surviving section had absorbed the impact of 1,100,000 loads!

Some 5,000 precision gages and measuring devices were installed in the test pavements. Special instruments were designed to measure changes in surface condition. Readings by the millions were recorded and processed through electronic computers. The thoroughness of the research reflects the scientific direction of the AASHO staff and the Highway Research Board of the National Academy of Sciences—National Research Council.

National Road Test findings will help solve today's problems in highway design and construction... assist engineers, officials and legislators in providing efficient, economical roads and streets in the years to come.

The fleet of trucks—from pickups to 54-ton semi-trailers —logged 17 million miles in circling five test loops.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

compassed a recruitment brochure, a benefits brochure, four magazine reprints, a complicated job application form, a security release form, and a college transcript release form. Efficient? This was the 83rd organization to be heard from.

¶ Of all the letters received, only five or six made even the slightest attempt to approach the applicant on a personalized basis. Besides the mimeographed letters, most of the others were impersonally brief.

¶ The survey turned up this feature — smaller companies do a much better job of recruitment follow-up than the large ones. They respond faster, require fewer forms to be filled out, and tend to make their correspondence more personalized, or, at least, to seem so.

¶ One company sent reprints of its advertisements that gave a complete description of projects in work. Another small organization enclosed a mimeographed listing, an extensive benefits program, and an attractive brochure extolling advantages of the area.

¶ Nonprofit organizations, formed under the sponsorship of the government or universities, also responded to the Equity application. Six sent expensive, lavishly printed recruitment brochures. The material was effective and comprehensive. It also arrived rather late in the game.

¶ Most of the responding companies ignored the fact that the majority of experienced engineers are married and have children. Not one company mentioned the availability of housing or schools." — Richard Rutter, in the *New York Times*, December 18, 1960.

Alternates and Separate Estimates

"The preparation of alternates and separate estimates now consumes nearly as much time as does the base bid. When all the wasteful repetitious expense of estimating is added together, especially on public works where the ratio of awards is perhaps one secured to twenty jobs bid, the time and money spent by contractors and subcontractors in obtaining work amounts to billions. It is criminal waste.

"It is high time that the construction industry did something about utilizing economic methods for requisitioning bids and awarding contracts. The waste and inefficiency resulting from the excessive and abusive use of alternates are . . . inexcusable.

"To be sure, separate estimates and alternatives are sometimes necessary, but in no event is there any justification for waste if a sound, stable, and prosperous economy is to be maintained. The construction industry is the most sensitive barometer of economic conditions and the spark-plug of prosperity or depression.

"Wasteful malpractices have now reached far beyond the limits of common sense . . .

"This Institute is ready to cooperate with architects, engineers,

"EASIER" Is the Word for Armco Steel Water Pipe

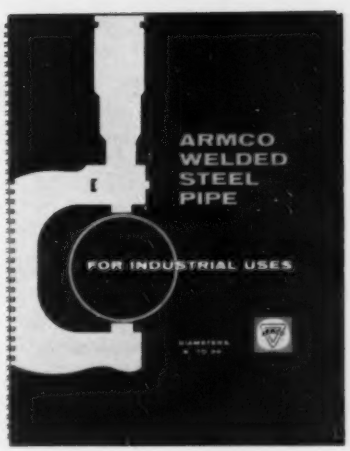
Steel
Strength
Economy
Durability

Designing lines is *easier*, because both standard and special fittings are available with Armco Pipe.

You'll find it *easier* to specify high quality, because Armco Pipe is made to nationally recognized specifications.

Then too, it's *easier* to get the exact size because diameters range from 6 to 36 inches with a choice of wall thicknesses from 7/64- to ½-inch.

It's also *easier* to get complete facts. For your copy of the 40-page Armco Manual, No. 8558, just tear out this page. write your name and address in the white space, and mail to us. Armco Drainage & Metal Products, Inc., 4221 Curtis Street, Middletown, Ohio.



ARMCO Drainage & Metal Products

and contractors in the promotion of sound economic practices . . .

"While the prevailing wasteful expenses are indirectly spread over many bidders it is difficult to realize that the cost of estimating is a great deal more than it should be due to needless repetition of surveys. At far less cost an accurate, unbiased professional survey could be issued which would be mutually beneficial to owner, architect, engineer, contractors, and subcontractors." — *Construction Surveying Institute.*

And What About the Engineer?

"On my desk are three interesting newspaper clippings. Clipped at random from the general news sections of leading New Jersey newspapers, each contains an architect's rendering of a different multimillion dollar project planned for construction in the near future — a shopping center, a large hospital, an apartment community for the elderly.

"Surprisingly enough, it is not what these clippings contain — but what they do not contain — which makes them interesting. For nowhere in each of these news stories, including the captions beneath the pictures, does the name of the architect who designed the project appear.

"This is not an unusual situation, and the frequency with which it occurs is hardly in keeping with the spirit of what one writer has called the 'age of the architect.'

"In all probability, in each of these cases, it was the project's developers who sent out the news releases to the newspapers. And just as probably, the name of the architect was omitted not out of carelessness, for this would indicate omission by error, but out of thoughtlessness. It may simply have never occurred to the developer that the architect's name would be of interest to the general public." — Paul E. Eisenman, "The Editor's Corner," *Jersey Architect*, Summer Issue, 1960. ▲▲

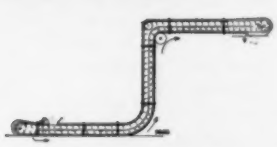
STEPHENS-ADAMSON

moves bulk material en masse vertically — horizontally — on inclines or around bends with REDLER® CONVEYOR-ELEVATOR SYSTEMS

S-A REDLER Conveyor-Elevators have a coveted 25 year reputation of successful operation. Well over 20,000 units handle a wide range of pulverized, granular, small lump and flaked materials in plants throughout the world. The REDLER Conveyor-Elevator moves material by EN MASSE action horizontally, vertically, on inclines or around bend corners. Material movement is continuous within totally enclosed, dust-tight compact casings, permitting large tonnage handling in small space. REDLER Conveyor-Elevators can be adapted to removing solids from a liquid bath in solvent extraction plants. The conveying elements, a series of U-type skeleton flights shown above in cut-away, move readily around sprockets and bend corners with relatively low power required at the drive. Skeleton flights may be easily unhooked and replaced without tools. S-A REDLER Conveyor-Elevator Systems speed efficiency reducing bulk materials handling to lowest cost per ton.

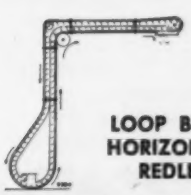
L-TYPE REDLER

Lower run can be horizontal or inclined. Elevating run can be operated at any required inclination. Special discharge openings can be spaced anywhere. Discharge to any one of three sides. Many variations of standard L-Type system available.



Z-TYPE REDLER

Combines two horizontal conveyors and one vertical elevator into one compact unit. One feedpoint, one discharge and one drive. Feed from choked feedpoints on horizontal run.



LOOP BOOT HORIZONTAL REDLER

Simplest form for elevating material up steep inclines. Column of material is supported on all four sides at inclines above the angle of slide for materials handled. Low headroom for feedpoints. Discharge gates placed wherever needed.

HORIZONTAL CLOSED CIRCUIT REDLER

"Run-around" type system employs side-pull conveying element. Permits conveying in several directions on horizontal plane. Available in two-way version featuring 180° bends and four-way version featuring 90° bends.

WRITE FOR BULLETIN 358

S-A
ENGINEERED BULK HANDLING SYSTEMS
SPHERCO® BEARINGS & ROD ENDS

ENGINEERING DIVISION

STEPHENS-ADAMSON MFG. CO.

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PLANTS LOCATED IN: LOS ANGELES, CALIF. • CLARKSDALE, MISS.
BELLEVILLE, ONT. • MEXICO CITY, D. F.

Architects: Cannon & Mullen, Salt Lake City

Air Conditioning from A to Z

From Acme to Zion National Park . . . complete Acme comfort conditioning for the striking new Visitors' Center. Yes, the entire system . . . including two *Flow Therm* Packaged Chillers, two Multi-Zone Air Handling Units, one *Econ-O-Mizer* Cooling Tower . . . bears the name Acme, one of the oldest, most respected names in air conditioning equipment.

And with this Acme system, perfect year around climate control is maintained in every area of the Visitors' Center. In variable weather the system shifts instantly from heating to cooling as conditions require. Sun and wind loads on different sections of the building are automatically compensated for . . . heating one section while cooling another, if necessary.

Certainly, the ideal temperatures and humidities of the dust-free Acme-conditioned air in the Center are an appreciated boon to Park personnel and visitors alike. Acme equipment is highly regarded, what's more, by the architects, engineers and contractors who specify and install air conditioning systems. For example, Mr. Roy Cowley of Wright, Cowley & Evans, consulting engineers on the Center job, has this to say "We have been very satisfied with the performance Acme equipment has given us, both on this job and on others. It's as good as anything on the market and we have nothing but confidence in Acme." You'll have "nothing but confidence in Acme", too, when you hear the complete story – get it from your Acme representative.

Acme INDUSTRIES, INC.

JACKSON, MICHIGAN • GREENVILLE, ALABAMA

MANUFACTURERS OF QUALITY AIR CONDITIONING AND REFRIGERATION EQUIPMENT SINCE 1919

The High Spots

Advertising Award

The first annual CEC Merit Award for Advertising was presented to the Minneapolis-Honeywell Regulator Company at the recent meeting of the Council's board of directors. In presenting the award, CEC president Hueston Smith cited the Honeywell advertising campaign, which "mentions consulting engineers favorably, highlighting their aims and principles, and encouraging use of their skills." The award was accepted by the Advertising Coordinator of the Minneapolis-Honeywell's Commercial Division, R. H. Jacobs.

Highway Research

One of the most comprehensive traffic engineering test centers in the world has been opened by the British Ministry of Science in Berkshire, England. The entire operation will not be complete for another four years. Center of the $7.5 million test facility is a three-mile figure-of-eight track.

The test center will be geared to the study of the causes of accidents, and perfection of accident-prevention systems. Tests will be made on vehicle behavior at high speeds, reactions under emergency braking conditions, and effects of vehicle imperfections. There also will be some testing of driver skills and capabilities.

One of the more important new features of the British track is a system of wires imbedded in the pavement of the track. These will be used for low frequency radio transmission of road conditions, warning drivers of traffic and adverse situations ahead. In addition, they will be tried as carriers for a homing beacon, which might be used to keep a car in the proper lane in case of driver inattention or poor visibility.

Construction in Russia

Following a 10-day stay in the Soviet Union, Edward Rice, of T. Y. Lin & Associates, returned to this country with pictures and impressions of the construction industry in Moscow and Leningrad. According to Rice, there are many factors contributing to the slow development of Russian industry:

¶ The emphasis on military technology has led to a shortage of skilled engineers for civilian work, so designs are stereotyped and often overused.

¶ Skilled labor is in short supply, and in many projects only the simplest of construction techniques can be employed.

¶ Many building materials are scarce and expensive. Both wood and steel are used sparingly, with heavy emphasis on reinforced concrete — often precast.

¶ A bureaucratic system of labor supervision produces drastic inefficiencies. Trucks are often only partly loaded, and inactive work-

ers are not free to move from job to job as needed.

¶ Architects and engineers both must work to the convenience of the constructor, with the end product often an unsatisfactory compromise of goals.

Rice noted that the Russians were very cooperative, and anxious to show all their skills and products. However, they were not at all receptive to suggestions for improvement.

New Officers

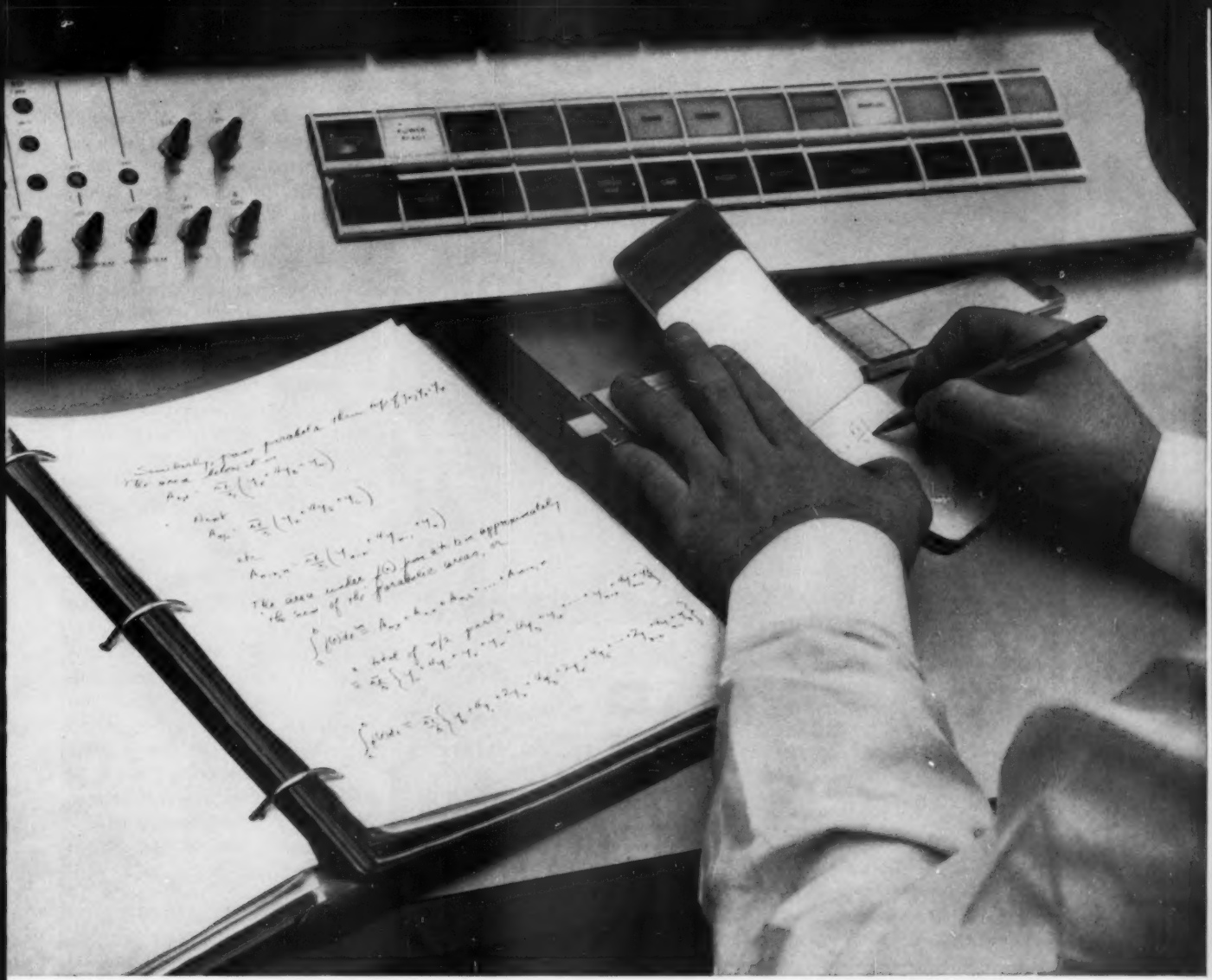
The Structural Engineers Association of California elected the following officers for 1961: president, Walter D. Buehler, Sacramento; vice president, Jack N. Sparling, Los Angeles; and secretary-treasurer, Norval W. Seattie, Sacramento. Directors are C. D. De Maria, San Francisco; Harold Omsted, Los Angeles; L. W. Graham, San Francisco; M. A. Larson, San Francisco; C. E. Nelson, Los Angeles; R. M. Wilder, Los Angeles; and D. M. Teixeira, San Francisco.

Tea Will be Served

The American Thrift Assembly, an organization formed several years ago to promote the enactment of a self-employed retirement bill, has been successful in being classified as a tax-exempt organization. But strange are the ways of the Bureau of Internal Revenue. Originally, the ATA applied for the same tax classification as that held by the National Society of Professional Engineers. This was denied on a basis that the ATA is primarily organized for lobby activities. But a tax-exempt status was granted to ATA, listing it as a "social organization."

Welding Design Competition

The James F. Lincoln Arc Welding Foundation has announced a new $25,000 award program for welded design of machines or structures. The competition, offering 76 awards in two categories, closes July 17, 1961. A booklet



Free engineers for creative assignments with the new low-cost IBM 1620

The IBM 1620 Data Processing System is a low-cost solution to the problem of freeing engineers for their most creative and profitable assignments. Here's why:

EASY TO USE—Just a two-day training class is all you need to put your 1620 into operation. This means no delays in learning to use the 1620 computer.

In addition, you get a wide range of free programming services including FORTRAN and GOTRAN. FORTRAN is the powerful scientific language that lets you solve problems without writing detailed computer instructions. GOTRAN is a simplified language (a sub-set of FORTRAN) that lets you enter simplified problem statements and data into the computer with the solution immediately available, in one simple operation.

FAST—The 1620 solves a set of ten simultaneous equations in only 20 seconds. It inverts a 10 x 10 matrix in just 42 seconds.

POWERFUL—The 1620 inverts a 40 x 40 matrix. With optional additional core storage the 1620 can handle matrix inversion problems of a much higher magnitude.

GET FULL DETAILS—The 1620 is the most outstanding engineering and scientific computer in its price range. A basic installation rents for just $1,600 a month.

To learn how the 1620 can free you for more creative engineering work, call your local IBM representative.

IBM's 1620 is a compact desk-size computer.

IBM®
DATA PROCESSING

describing the awards and rules of the contest is available without charge from the James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

Italians in Tunisia

Italconsult, an Italian consulting engineer firm, has been retained by the government of Tunisia to plan a network of artificial lakes in the Medyerdah Valley. The lakes are to be used as reservoirs in the Tunisian project for reclamation and irrigation of about 150,000 acres of barren land. The whole project will cost nearly $90 million.

25 Years of Soil Cement

The South Carolina State Highway Department is quietly marking the Silver Anniversary of the use of soil cement. The Highway Department pioneered in the use of pulverized soil and road material with portland cement for subsurface and secondary roads. The first of these soil cement roads opened to public use was a mile-and-a-half section of Route 41, near Johnsonville. The same road is still in use, still in good condition.

New Okinawa Power Plant

The Kuljian Corporation, of Philadelphia, has been awarded a $20 million contract for the construction of an 88,000-kw steam power plant on the island of Okinawa. The new power plant is intended to supplement the existing power sources on the island.

New Cornell Study

The United States Public Health Service has granted Cornell University a total of $172,000 to study the application of electronic computer methods to sanitary engineering education. The grant, which starts in July of this year, will run for five years.

The study group at Cornell, under the direction of Professor Charles Gates, will try to set up a comprehensive program of systems engineering methods, making full

use of computers. The new educational system, if perfected, would produce sweeping changes in the field. Instead of having to analyze individual components of a problem, students and engineers would be able to concentrate on the overall picture, leaving all of the details to the computer.

Learning From Mistakes

Engineers at the National Physical Laboratory in England are studying films of one of the world's most spectacular bridge failures, hoping to design their own structures to prevent similar trouble. Pictures of the suspension bridge at Tacoma, Washington, which literally shook to pieces in a high wind storm 20 years ago, are being reviewed to check theories of stress. The British are particularly interested in this failure because of the many sections of their own country where bridges must be built to withstand extremely high, erratic winds. The researchers also are studying model suspension bridges under low speed wind tunnel conditions.

World's Fair Service

The New York consulting firm of Seelye Stevenson Value & Knecht, in conjunction with the industrial design firm of Cushing & Nevell, is offering an integrated design service for prospective exhibitors at New York's 1964 World's Fair. The two organizations are offering what they call complete planning and design service. They will handle all details of the exhibit for a client, including preliminary layout, construction supervision, display changes, and even design of uniforms for attendants.

Honorary Memberships

The Structural Engineers Association of Southern California, at their last meeting, announced the awarding of honorary memberships to David Narver, of Holmes & Narver, Inc., Los Angeles, and to Dr. George Housner, of the California

A 2% HEAT LOSS

can cost YOU $2,000 a month!

Report is based on actual calculations.

The illustrated Insulation Efficiency Report, is a cost comparison study of a Ric-wiL Underground Steam Distribution System vs. a competitive type system. The report is based on actual calculations, using the National District Heating Association's method for determining heat loss. The findings show a 2% heat loss that in one month can cost the owner $2,000.00 in increased steam cost.

The report is yours for the asking . . . and, if you do not already have a Ric-wiL Catalog, ask for a copy along with the report.

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

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IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

Institute of Technology. Narver was cited for his work in advancing structural design standards. Housner was honored for his studies of earthquakes and quake-resistant building design.

Jersey Meadows Development

A study made recently by the Greer Engineering Division of Woodward-Clyde-Sherard & Associates has shown that the 30,000 acres of salt marshes known as Jersey Meadows can be used successfully for industrial development. The study was made for the U. S. Post Office, which plans to build a large parcel post distribution center in the area.

Moroccan Engineering School

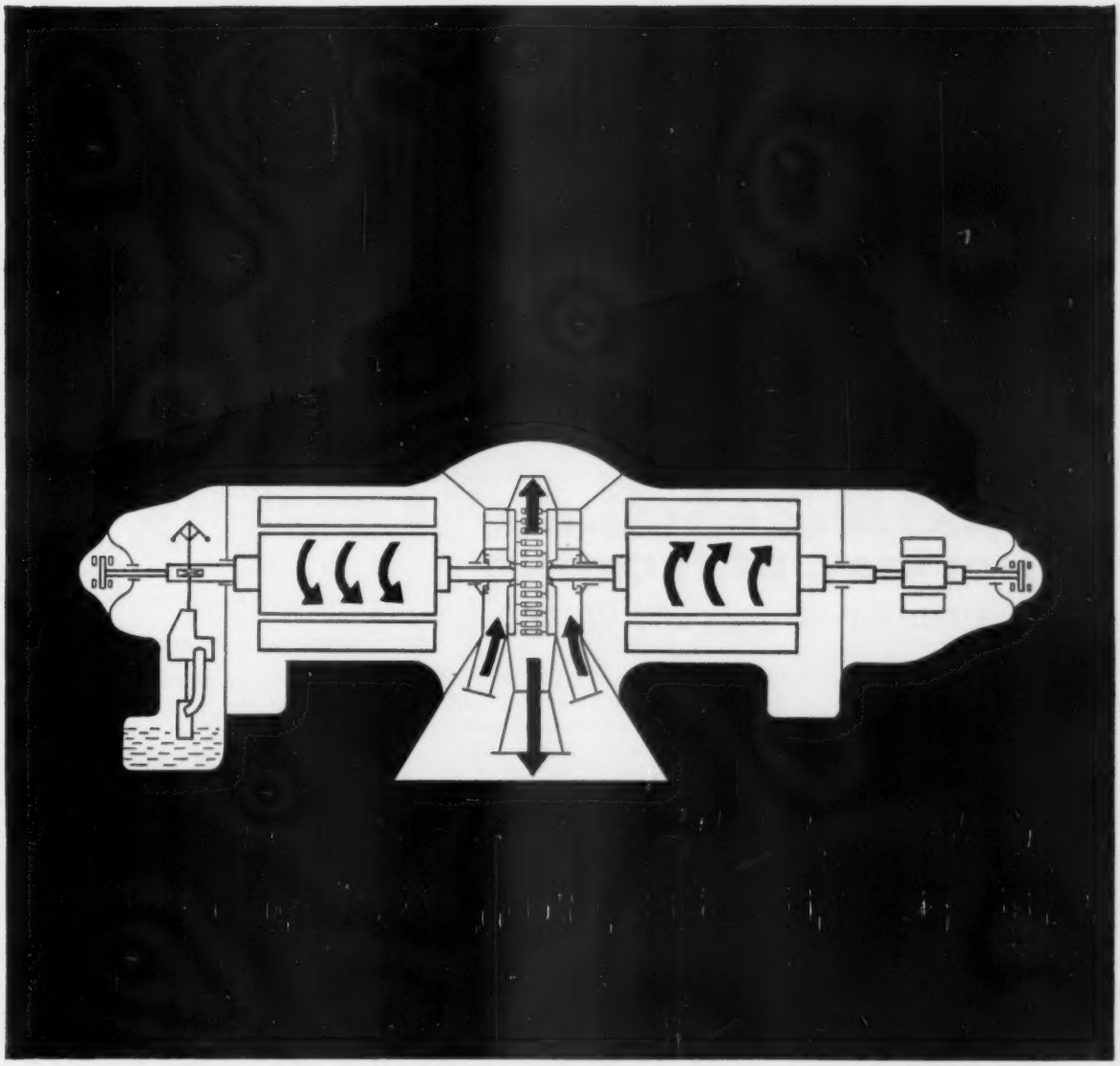
The government of Morocco has opened that country's first technical college – the Mohammedia Engineering School, in Rabat. The school was built entirely by the Moroccans, but it will be aided in operation by funds from the United Nations. The UN also is trying to recruit teachers for the new school, which will specialize in mechanics, electricity, mining, and public works engineering.

Graduate CE Scholarships

The national civil engineering honor fraternity, Chi Epsilon, has made a survey of the scholarships, fellowships, and assistantships available to graduate civil engineering students in 1961. The survey shows that various graduate programs offer over 500 individual awards for advanced study, with a total value of about $1 million. Single copies of the detailed report can be ordered from Michael Spronck, Chi Epsilon, Martinsville, N. J.

ACI Convention

The American Concrete Institute will hold its 57th annual convention at the Chase-Park Plaza Hotel, in St. Louis, February 20-23. The first day and a half of the meeting will be taken up with discussions by technical committees, with a forum

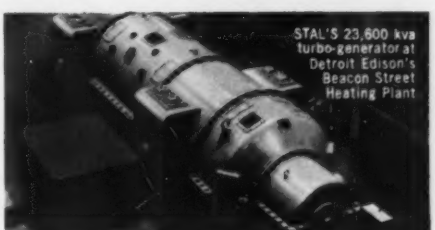


The First Radial Double Rotation STAL Steam Turbine In The United States

The last word in thermodynamic efficiency, lowest space requirements, inexpensive foundations, and low crane costs is Sweden's Radial Double Rotation STAL Steam Turbine. Designed to meet the most demanding requirements, STAL Steam Turbines are installed in power stations the world over with unparalled success. The ease of handling and simplicity of operation will make the Radial Double Rotation Turbine a favorite with power stations, paper mills, chemical plants and hundreds of other users in industry here. For free illustrated booklet write to: ASEA ELECTRIC, INC. 500 Fifth Avenue, New York 36, N. Y./55 New Montgomery St., San Francisco 5, California.

U.S. Representatives DeLaval-Ljungström Turbine Co.

ASEA



STAL'S 23,600 kva turbo-generator at Detroit Edison's Beacon Street Heating Plant

Specifications

Make .....STAL	Turbine Heat Rate....3506 Btu/kwhr
Type.....Radio flow double rotation	2-3600 rpm Generators —Air Cooled
Throttle Steam Conditions...870 psig, 700F	Power Factor 0.85
Maximum Throttle Flow... 500,000 lbs/hr.	Back Pressure.150 psig
Heaviest Life During Erection..... 21.5 tons	Rating .....23,600 kva (combined)

on technical committee progress. Technical papers will be presented by about 20 American and European concrete authorities.

Air Test Code

The Air Moving and Conditioning Association has published a new standard test code for all air moving devices. The new code is covered in *AMCA Bulletin 210,* available from the Association at 2150 Guardian Building, Detroit 26, Michigan. The report is based on nine years' research at the University of Detroit, and is broader in scope than any published previously. The new code establishes uniform methods for testing all types of air handling equipment, and is planned to provide more accurate data for performance ratings.

Silicalcite in Hydraulics

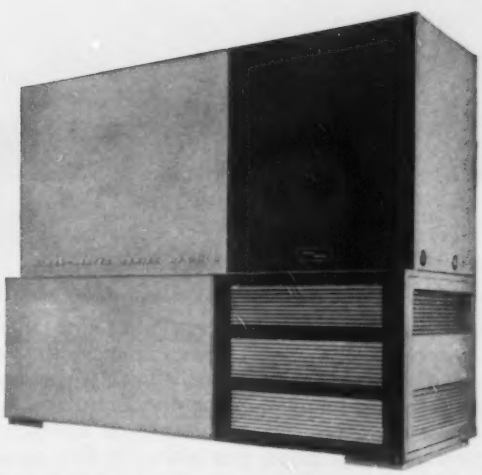
A recently published Russian technological abstract tells of the use of silicalcite in hydraulic engineering. Silicalcite, an artificial combination of limestone and sand, was developed in Estonia, and has been used primarily in housing work. The Russian report says Soviet scientists have produced structural elements that can stand a pressure of 20,000 psi. Silicalcite is reportedly 10 times better than concrete in water absorption. Presently there are 37 plants in Russia producing, or being readied to produce, silicalcite. Specialists from Italy, France, and England have expressed interest in the material.

Level Indicator

A British firm has developed a new electronic level indicator that will register changes in level of less than one second of arc, or about six hundred-thousandths of an inch in one foot. The leveling mechanism in the new instrument is a pendulum linked with transducers, providing an electric displacement signal. The signal is fed through an amplifier to a center zero meter. Readings are in gradients or angles. ▲▲

A MAJOR BREAKTHROUGH IN COOLING & HEATING

ARKLA'S NEW 25-TON GAS CHILLER-HEATER



Here it is—the revolutionary new Arkla absorption unit that heats and cools without a steam producing boiler or converter. Gas-fired burners in the generator section energize the system for absorption cooling, or for heating. It's the perfect system for modern year 'round gas air conditioning.

INSTANTLY HEATS AND COOLS AUTOMATICALLY ■ HEATS WATER WITHOUT A BOILER ■ COOLS WATER WITHOUT A COMPRESSOR ■ REQUIRES NO LUBRICATION ■ SEALED FOR LIFE, REQUIRING MINIMUM MAINTENANCE ■ MAINTAINS SAME CAPACITY FOR THE LIFE OF THE UNIT ■ HAS NO MOVING PARTS IN THE HEATING AND COOLING CYCLE ■ FIRST MEDIUM OR LARGE TONNAGE AIR CONDITIONER THAT HEATS. Truly revolutionary . . . investigate for your next building project the new Arkla DF-3000 Gas-fired All Year® Chiller-Heater. For details contact your local Gas Company. Or write Arkla Air Conditioning Corporation, 812 Main Street, Little Rock, Arkansas. *American Gas Association*

FOR HEATING & COOLING GAS IS GOOD BUSINESS!

Photo courtesy of San Francisco Chamber of Commerce

Golden Gateway

Beautiful, cultural, cosmopolitan San Francisco is the center of the West Coast mining area, processor of California's fabulous fruit and farm crops, and one of the nation's major distribution points and financial areas. Its importance as a western rail terminal has grown ever since the final spike was driven in the first transcontinental line, and four Class I railroads now serve the city. One of the country's outstanding electric utilities has stimulated growth by serving expanding power needs.

Kerite has anticipated and met the constantly increasing demand for electric cable, with a standard of dependability which began in 1854. ***And as the need for quality cable continues to grow, Kerite will be ready to supply it.***

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it's the **KERITE** *that makes the difference*

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The New Projects

New Concrete Bull Ring

The world's second largest bull ring has been built in Tijuana, Mexico. Structural members are pre-

New Tijuana, Mexico, bull ring was built in just 90 days.

stressed concrete. The 23,000-seat plaza is remarkable because it was built in only three months. The construction of a major bull ring ordinarily takes from two to ten years.

Halfway through the project, the consulting engineer, Dorlan-Ferver Associates, of San Diego, California, had to revise their plans completely when the owners decided to nearly double the size of the ring. The final exterior diameter of the stadium is 354 feet. The highest seats are 75 feet above the ring, and the entire ring is visible from every seat.

Garden City Express Terminal

The Railway Express Agency has opened its new express terminal at Garden City, New York, to serve Nassau County and Queens. The half-million dollar facility, designed by Engineers, Inc., of Newark, incorporates a permanent motorized conveyor system that is said to provide greatly improved service for the 122 communities in the area.

Dover Power Plant

A new $9 million thermal power plant for Dover, the capital of Delaware, is scheduled for commercial operation early in 1962. The new plant, with an initial installed capacity of 33,000 kilowatts, was designed by the Kuljian Corporation, of Philadelphia. Two 16,500-kw turbogenerators will operate on pulverized coal, with provisions to switch to gas or oil.

New York Bus Station

The Port Authority of New York has awarded contracts for the construction of the new $13 million George Washington Bridge Bus Station to the Barney and Crow Construction Companies of New York. Work on the two-block, three-level terminal already has begun, with completion scheduled for early next year. The station is part of the $183 million

George Washington Bridge lower level project, and will feature a concrete roof designed by Pier Nervi.

When opened, the terminal will be able to handle 2000 busses and 50,000 passengers daily. It will consolidate and replace bus operations now being handled by several scattered stations in the area.

Coed Residence Hall at UCLA

The University of California at Los Angeles has opened its second on-campus residence hall, Sproul Hall. The $3½ million structure, designed by the Los Angeles firm of Welton Becket and Associates, will

Sproul Hall, the new $3½ million residence hall at UCLA.

house over 800 students in two separate wings, one for men and one for women. The two wings, seemingly one building, are actually distinct structures, separated by a seismic joint. Sproul Hall was planned to complement the design of the existing Dykstra Hall, and will be a model for future residence buildings on the campus.

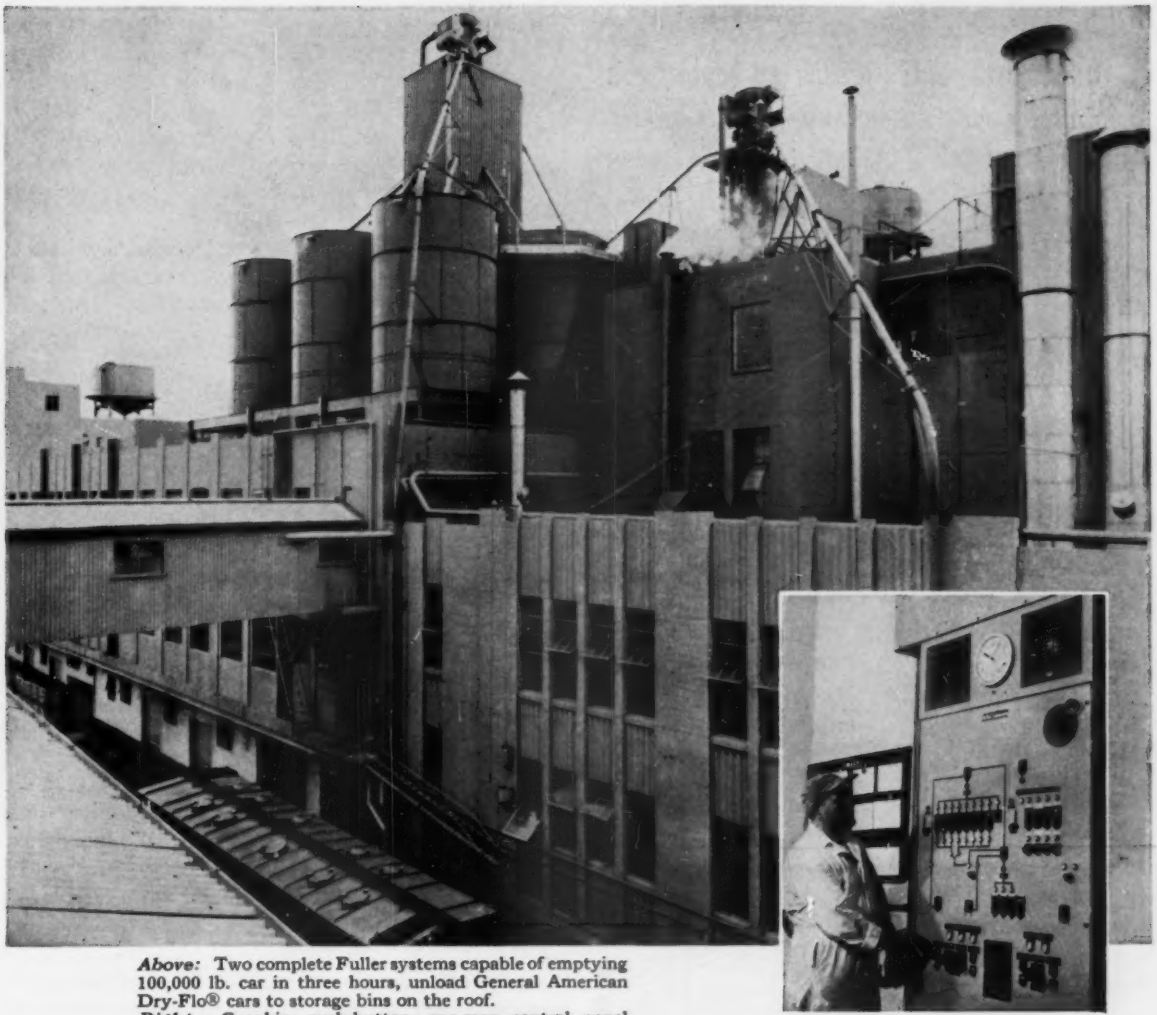
Automatic Saw Mill

The Seattle, Washington, consulting firm of Tracey, Cook, Brunstrom and Dudley has designed a $1 million saw mill for the Simpson Logging Company. The new mill is almost completely automated, with all operations controlled through a magnetic memory system. A crew of only 17 men can produce 120,000 board feet of lumber in one 8-hour shift.

The consultant used the client's product throughout the building. The frame is of wood columns, laminated wood panels, and plywood box beams. The roof is stressed skin plywood panels; side walls are wood girts with wood cripples and one thickness of coated ⅝-in. plywood.

Liquid Metal to Combat Rust

Dennis Cox, a young British engineer, has discovered what he believes is the ideal method for protecting against rust in all structures and vehicles. His idea is to paint them with liquid metal. Since corrosion



Above: Two complete Fuller systems capable of emptying 100,000 lb. car in three hours, unload General American Dry-Flo® cars to storage bins on the roof.
Right: Graphic, push-button, one-man control panel handles unloading, conveying and reclaiming.

NO PLACE TO GROW BUT UP

. . so Burgermeister put 12 new storage bins on the Brewhouse roof

Putting a head on beer is one thing, but putting a head on the Brewhouse roof might seem an insurmountable obstacle. This growing San Francisco brewery was up against it for storage space. With no further room for lateral expansion, the only place to grow was up—but how? Could additional bins be loaded at such a height?

Fuller engineers were able to provide the answer. Airveyor® Pneumatic Conveying Systems don't balk at height. So twelve additional bins were mounted on top of existing equipment, and two separate Airveyor systems were installed. They even incorporate components from an existing Airveyor system which had been installed in 1947.

Now, with ample storage space, grits are unloaded from covered hopper cars to bins in just over three hours per 100,000-lb. car. The same quantity of malt travels the route in a little over two hours. And reclaiming and blending are handled at an equally high rate—all controlled by one man at a Fuller graphic control panel. Burgermeister has greater production with greater economy — as breweries must do to keep ahead today.

The success of Fuller in handling problems like those at Burgermeister is confirmed by repeat orders from customers everywhere. Breweries nation-wide look to Fuller to study their needs for expansion, higher production and for new brewery installations. Why not find out for yourself why they do it—and what Fuller can do for you? 2625 A-29 2

"See Chemical Engineering Catalog for details and specifications".

FULLER COMPANY GENERAL TRADE MARK

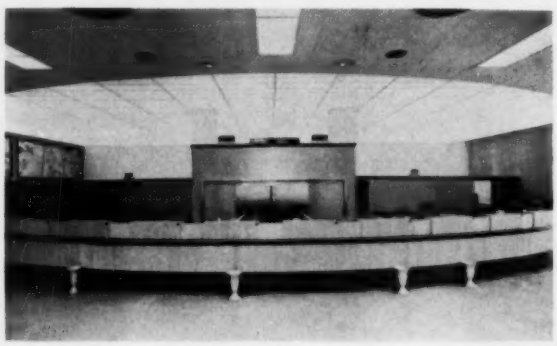
FULLER COMPANY
118 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
. . . pioneers in harnessing AIR

in metals starts as an electrical action rather than a chemical action, Cox believes the corrosion can be prevented by diverting the current from the structural material to the thin layer of painted-on metal. The British government is testing his plans on pylons at electric power plants in several sections of England.

Curved Ceiling Light

The new main lobby of the First Federal Savings and Loan Building, in St. Petersburg, Florida, has a novel ceiling lighting system which matches exactly the



Curved lighting system in St. Petersburg, Florida bank.

curve of the row of tellers' cages. Open cube Guth Gratelite diffusers provide an over-all illumination level of 50 footcandles. Consultant for the project was Russell Raine and Associates, Winter Park, Florida.

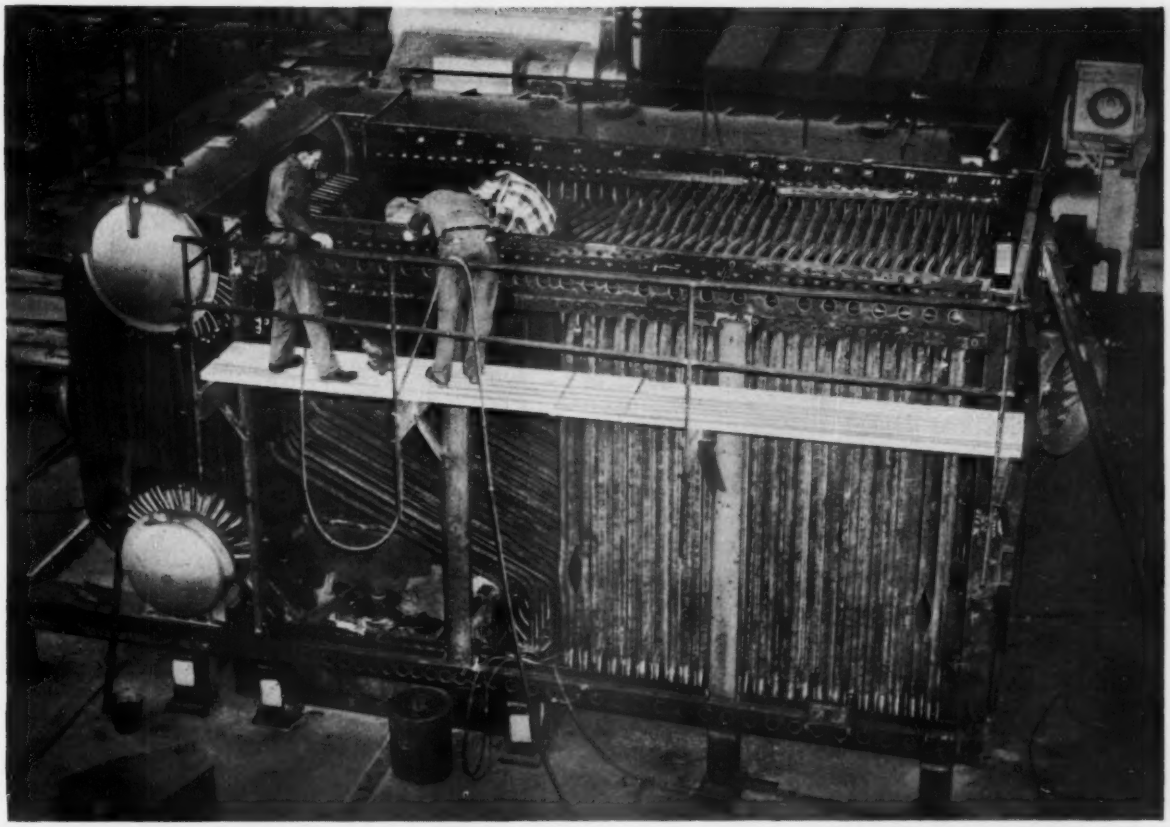
Zinc on Throgs Neck Bridge

Nearly 130 tons of zinc, applied by continuous galvanizing, will be used to protect the thousands of miles of steel wire used in the new Throgs Neck Bridge, connecting the New York boroughs of Queens and the Bronx. Each of the two main suspension cables of the 2¼-mile bridge will be about 23 inches in diameter, composed of nearly 11,000 banded galvanized steel wires.

Ammann & Whitney, of New York, consultant for the project, chose zinc because of its efficiency in corrosion prevention. Galvanized steel also will be used in the Triborough bridge, planned by the New York Tunnel Authority.

Project EHV

The General Electric Company, in cooperation with 12 other firms, has set up test facilities to study the problems of transmitting electric power at up to 720,000 volts instead of the present 115,000 to 345,000 volts. The over-all cost of Project EHV (Extra High Voltage) will be about $7.5 million; GE will pay about $6 million of it. The major part of the test center is located near Pittsfield, Massachusetts. When com-



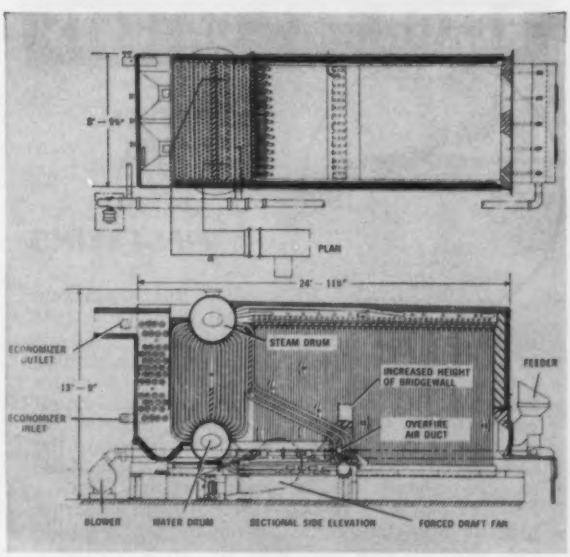
Stoker-fired boiler being shop assembled.

Coal fuels this push-button packaged steam generator

Good news for industry in areas where coal is economical —FW stoker-fired *packaged* steam generators that are comparable with the most advanced gas and oil fired units. Engineered and built with precision, the design has been thoroughly proved and tested in more than two years of operation at full design capacity and above. Performance has been consistently better than expected under all operating conditions.

Units designed for semi-automatic operation are available in three standard sizes: 43,000, 50,000 and 63,000 lb/hr steam capacity at pressures to 250 psig. Push-button control brings these units on or off banked fire. They may be converted to oil firing in a matter of hours. And for easy handling and speedy low-cost erection, they are shipped in three major subassemblies, one of which is the complete boiler and economizer section shown above and at right.

For complete performance and descriptive data on FW stoker-fired packaged steam generators, request bulletin PG59-4. Standard oil and gas fired units are also available in capacities from 13,000 to 100,000 lb/hr. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York.



Heat Engineered products, plants and processes . . . for the world's industrial progress.

FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

pleted later this year, it will be the largest and most powerful high voltage test center in the world.

The United States is relatively late in the exploration of the possibilities of ehv. Many other countries have been working on it for years, and Germany was making high voltage tests before World War II.

In addition to the industrial firms, 14 consulting engineer firms are taking part in the study. They include: Bechtel Corporation; P. L. Bellaschi; Southern Services; Stone & Webster; Commonwealth Associates; Jackson & Moreland; Black & Veatch; Gibbs & Hill; Pioneer Service and Engineering; Charles T. Main; Sargent & Lundy; Gilbert Associates; Kaiser Engineers; and Ebasco Services. The entire test project will be under the supervision of Dr. Pier A. Abetti, a distinguished Italian electrical engineer.

Nyasaland Water Project

Work has begun on a second segment of the $7 million water supply project for Nyasaland, in Central Africa. An African firm, Richard Costain, was awarded the contract for the work designed by the consulting firm of Scott & Wilson, Kirkpatrick & Partners, of Blantyre, Nyasaland. The present section of the project was contracted for $1.2 million.

Portable Seismograph

The Kansas City office of Woodward, Clyde, Sherard and Associates completed a preliminary site survey for a Kansas City school, using only two borings to

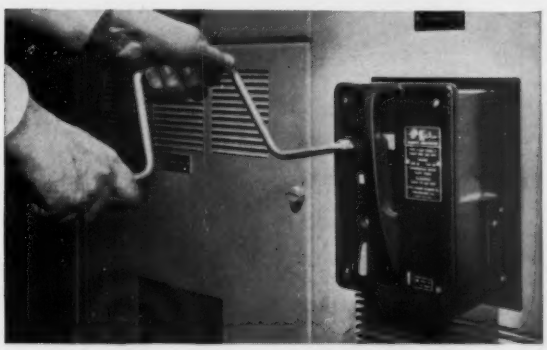
Portable seismograph used for preliminary cross-sections.

check the findings of a small portable seismograph. The two man apparatus, made by Geophysical Specialties Co., reportedly saved time and money.

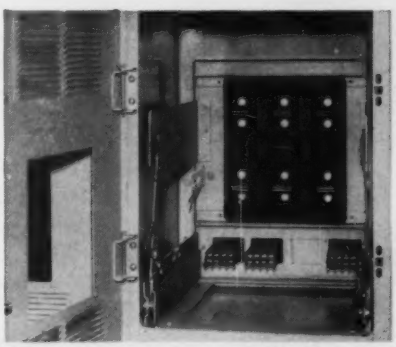
As used by WCS, the instrument is about the size of a portable tape recorder, and requires only a sledge hammer as additional equipment. With one man operating the detector and the other swinging the hammer, two men can finish an average 100-ft traverse

STILL THE MOST ADVANCED 600 VOLT SWITCHGEAR!

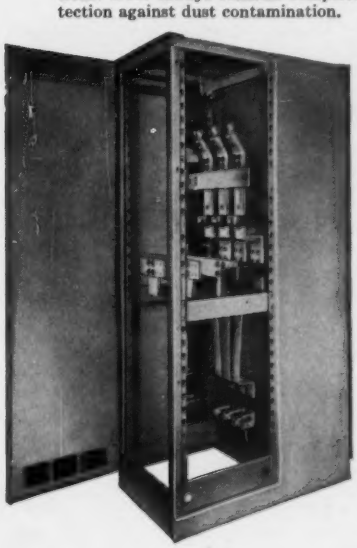
Four years ago, I-T-E introduced its completely new design advanced 600 volt switchgear with K-Line circuit breakers. In all this time right up to the present, no other gear modified or redesigned has been able to match it. Here still is today's most advanced gear, with easier operation, simpler upkeep, longer life, higher safety, and greater assurance of dependability than any other. Compare for yourself. For detailed literature, write I-T-E Circuit Breaker Co., Dept. SW, 1900 Hamilton St., Phila. 30, Pa.



Dependable drawout mechanism. Sturdy crank drive moves breaker on nonfriction rollers. Won't let you down when you need it most. Breaker can be padlocked in connected, test or disconnected positions. Door always remains completely closed for unequaled protection against dust contamination.



Complete isolation of breaker compartments. Each breaker is completely surrounded by solid steel barriers between it and other breaker compartments. No risk of arc gases contaminating an adjacent breaker through openings in partitions. Note also that secondary disconnects are located at the bottom of the compartment, safely removed from arc gases.



Silverplated bus. You pay no premium for this feature in I-T-E 600 volt switchgear. Aluminum bus is silverplated over its entire length for maximum conductivity. Reduces the required mass of the bus for a given maximum current. Bus is rigidly braced against movement in any direction from short circuits.

Easy-to-operate stored energy closing. Just pull down the handle, slow or fast as you please. Contacts close firmly in only 5 cycles for fast, uniform closure every time. Pulldown handle means easy operation of all breakers—top row, bottom row, or in the middle. Electrical closing mechanism, available optionally, uses a low current motor, not a solenoid.

I-T-E CIRCUIT BREAKER COMPANY

in less than an hour. The results give an approximate subsurface cross-section to a depth of 30 to 50 feet, indicating the level of bedrock and the probable composition of intervening material.

In general use, the portable seismograph cannot replace borings and more accurate measurements, but it is extremely valuable in corroborating other data, and in preliminary work where speed and mobility are basic considerations. WCS has used the equipment successfully on over 50 different projects.

Multipurpose Ceiling Tile

The Armstrong Cork Company used its own ceiling products in air conditioning its general office building in Lancaster, Pennsylvania. By drilling small holes

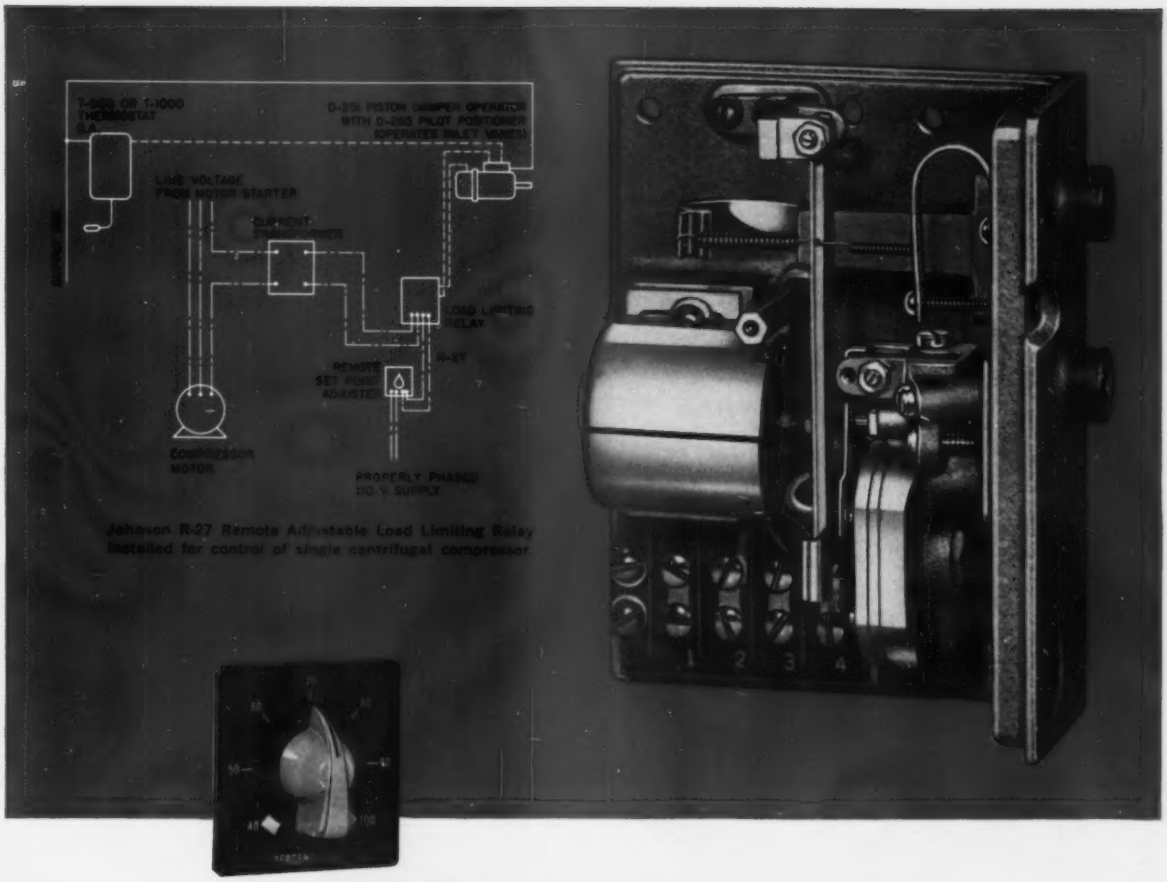
Specially perforated acoustic tile used as air diffuser.

in acoustical materials, the company saved the cost of extensive duct work. Only a duct stub is used in each room, to discharge conditioned air into the plenum above the ceiling. The holes in the ceiling tile effectively diffuse the air, and do not interfere with the acoustical properties. The idea of using the plenum as a storage chamber for conditioned air is not new, but the Armstrong Building is the first one to use perforated mineral tile for diffusing the air. Consultant on the project was C. S. Leopold, Inc., of Philadelphia.

Pakistan Power Station

The Canadian consulting firm of Stadler Hurter International Limited, of Montreal, has been retained as engineer for the proposed new Sukkur power station, in West Pakistan.

The new station, supplying Sukkur and adjoining districts, will distribute power over approximately 145 miles of transmission lines. Initially, the station will have only two, 12,650-kw steam turbines, but it will be laid out for eventual expansion to 100,000 kw. Gas from adjacent fields will be used for fuel. ▲▲



Johnson R-27 Remote Adjustable Load Limiting Relay installed for control of single centrifugal compressor.

New JOHNSON R-27 remote adjustable load limiting relay

For Positive Protection Against Motor Overloading *PLUS* The Convenience Of Remote Adjustment

- An outstanding new limiting device for use with pneumatic control systems. May be applied to all makes of centrifugal refrigeration compressors, as well as to pumps, fans, and electric heating systems.
- Provides efficient, positive protection against costly motor overloading. Prevents failures and damage to equipment.
- Convenient remote set point adjuster can be surface mounted on any wall or control panel or flush mounted in a panel.
- Set point adjuster is calibrated between 40 and 100 per cent of full motor current, in 10 per cent increments.
- Relay operates at any current value between 3 and 7 amps. With proper transformer, can be applied to motors of any size.
- Sensitivity is adjustable from 10 to 37 psi/ampere.
- Fast, highly accurate response. Pneumatic feedback element assures maximum stability and performance. Simple, trouble-free construction throughout.

For complete information, write for bulletin R-27. Johnson Service Company, Milwaukee 1, Wisconsin.

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PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

STRONG strainers in condensate line in new Cleveland skyscraper.

select the STRONG® strainer *designed for you!*

IN steam, air, gas, water, oil or chemical systems, a *correctly selected* strainer pays for itself many times. It protects expensive equipment (traps, control instruments, meters, etc.) and reduces over-all maintenance and service costs.

Assure your system maximum protection from dirt, scale, sludge and sediment . . . specify *the* STRONG strainer designed for your requirements.

Sizes: from ¼" to 8"

Service: 250 psi at 450° F to 2500 psi at 1100° F

Screens: stainless screens with .027", .045", .062", or .125" perforations (at no extra cost)

Types: "Y" or Angle with screwed or socket-weld (flanged) connections

Materials: semi-steel, ductile-iron, bronze, Monel, cast or block steel, or new all-stainless or Hasteloy

STRONG'S extensive line of rugged, high-quality strainers are available from your local STRONG distributor. Contact him for assistance in selecting the *right* strainer, or write for your copy of STRONG Bulletin SS—21C.

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high-quality steam and air traps • strainers • regulators • valves • separators • and other steam and fluid controls

Men and Firms

Willis F. Thompson, executive vice president of Westcott and Mapes, Inc., New Haven, Connecticut, has been elected president of United Engineering Trustees, Inc.

Metcalf & Eddy, of Boston, was recently commended by Wilber M. Brucker, Secretary of the Army, for outstanding performance as architect-engineer for the Ballistic Missile Early Warning Systems at Thule, Greenland and at Clear, Alaska. The commendation was in the form of a Certificate of Appreciation for Patriotic Civilian Service to the Department of the Army. It was presented to Harrison P. Eddy, Jr., a partner in the 63 year old consulting firm, by Lieutenant General E. C. Itschner, Chief of Engineers, acting on behalf of Secretary Brucker, during brief ceremonies held in New York.

Four consulting engineers will present papers before the Pacific Regional Conference of the International Road Federation to be held in Sydney, Australia, February 27-March 3. Hugh P. Duffill, Duffill Associates, Boston, Massachusetts, will discuss "The Design of In-

tersections for Limited Access Highways." Wilbur Smith, Wilbur Smith & Associates, New Haven, Connecticut and Columbia, South Carolina, will present a paper on "Economics of Road Construction and Road Transport." "Toll and Free Highway Bond Financing" will be the subject of Thomas J. Fratar, a partner of Tippetts-Abbett-McCarthy-Stratton, New York City, while R. E. Smith, Capitol Engineering Corporation, Dillsburg, Pennsylvania, will talk on "Design, Location, and Highway Construction Methods." This Pacific Regional Meeting will bring together representatives from the National Road Associations in Japan, the Philippines, India, Ceylon, Australia, and other Pacific region nations. Senator John A. Blatnik will address the opening session.

The Oklahoma Section of ASCE has elected Allen G. Poppino, chief structural engineer for Benham Engineering Company, Oklahoma City, as their new president. Also elected were Joseph E. Perry, U. S. Army Corps of Engineers, vice president; and James W. Gillespie, secretary-treasurer.

POPPINO

METZ

The Illinois Section of ASCE, at its recent annual meeting, presented the 1960 award for the outstanding Civil Engineer of the Year to Carl A. Metz, structural engineer, Shaw Metz & Associates.

Charles E. Woodward, former member of the city planning staffs at Portland, Oregon and Oakland, California, has been named planning consultant by Wilsey, Ham

& Blair, planning and engineering firm of Millbrae and Los Angeles.

John J. Andrews, senior electrical engineer of Smith, Hinchman and Grylls Associates, Inc., Detroit architectural and engineering firm, has been named an associate. Andrews has been a member of the SH&G staff since 1950.

Tracey, Cook, Brunstrom and Dudley, engineers and architects of Seattle, Washington, has established a branch office in London. Richard M. Tracey is managing partner of the London office, and Lawrence H. Zibell is the senior project engineer.

Ernest F. Siegel, formerly chief mechanical electrical engineer of Green Associates, Inc., consulting engineers, Baltimore, has opened his own office for the practice of consulting engineering in the mechanical and electrical fields. Address of the new firm is 4119 Hayward Ave., Baltimore 15, Maryland.

Urban Engineers, Inc., civil and structural engineering consultants, has opened a new office at 1619 Chestnut Street, Philadelphia. Principals of the new firm are: Robert C. Olson, president; Edward J. D'Alba, chief civil engineer and vice president; K. Yervant Terzian, chief structural engineer and secretary, and Thomas Buckley, staff consultant.

Special tribute was given to 10 Thai power engineers by representatives of the Thailand government, the Export-Import Bank, and the City of Philadelphia, at a luncheon held recently by The Kuljian Corporation, Philadelphia engineers and constructors. The young engineers were honored for the successful completion of an intensive six month technical intraining program provided by The Kuljian Corporation. Early next year, in further preparation for future operating responsibility, they

Composite Design for Buildings

Composite design is the technique which permits a concrete slab to work as an integral part of supporting beams. By joining slabs and beams together, through the use of shear connectors, the ultimate capacity of the structure is considerably increased. The structure then becomes monolithic . . . its slabs deforming along with the beams.

FIRST IN BRIDGES. Composite design has been employed in bridge construction since the early '30's for specific economical and structural advantages not found in more common "slab-and-stringer" design. Applying the composite design concept to building construction, we find the same basic advantages still prevail.

REDUCED STEEL TONNAGE. Composite design will usually cut steel tonnage from 15 to 25 percent, thus reducing steel cost. Shallower beams may be used to meet given load and floor deflection requirements—or added load may be accommodated without increasing the beam size.

MORE CLEAR SPACE. The greater load-carrying capacity per pound of steel means wider spacing of columns, more unobstructed floor space.

GREATER DESIGN FLEXIBILITY. When particular floor areas of a building must have higher load capacities, composite design meets these requirements without affecting the rest of the structure.

LESS STRUCTURAL DEPTH. Composite design reduces over-all building cubage. Economies result in the decreased requirement of facing materials, ducts, piping and wiring, as well as columns and foundations.

A CASE IN POINT. The Federal Court House and Office Building of Brooklyn, New York, is the largest Composite Design building to date.* It is a seven-story court house and a four-story office building joined together. Composite design resulted in a 21 percent saving in steel.

DESIGN CONSIDERATIONS. The first method considered was that of conventional design, as shown in Figure 1, using an 18" wide flange, 64-pound beam. It was suitable for the span of 25 feet and was heavy enough to carry both the dead load (concrete) and the live load of 50 pounds-per-square-foot.

The estimate figured steel at 15¢ per pound, erected. Since this beam weighs 1920 pounds, its cost-in-place would have been $288.00.

In considering composite design (see Figure 2), it was found that the beam size could be reduced from an 18" W/F 64 to a 12" W/F 27-pound beam by adding Nelson stud shear connectors and a 17" x 23" bottom cover plate. Also included in the calculations was the need for one shore at center point.

SUBSTANTIAL SAVINGS. On this basis, again figuring at 15¢ per pound for steel, the lighter beam, weighing only 810 pounds, would cost $121.50. About 80 Nelson stud shear connectors would be needed per beam and these were figured at 45¢ each, in place, for a cost of $36.00. The bottom cover plate, shop fabricated, weighed 391 pounds and at 15¢, cost $58.50. The cost of the center shore was figured at $12.00 per beam. This would make the conventional beam cost about $60.00 more than the composite beam, or the difference of $288.00 as against $228.00.

NEW DEVELOPMENT. The recommendations for the design of composite beams in building, as developed by the ASCE and the ACI, are now available. For a copy of these recommendations, plus a new fact-filled booklet on "Composite Construction For Buildings", write to Nelson Stud Welding, Division of GREGORY INDUSTRIES, INC., Dept. 14, 28th Street & Toledo Avenue, Lorain, Ohio.

**Structural Engineers: Seelye Stevenson Value & Knecht, of New York City.*

NELSON

Material and Erection Bid Figures per Steel Beam in Federal Court House and Office Building, Brooklyn, N. Y.

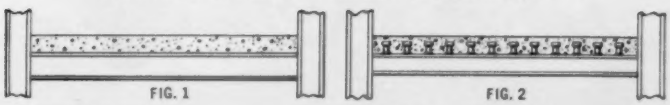


FIG. 1 FIG. 2

Conventional Design— 18" W/F 64—1920 lbs.	
Steel at 15¢	$288.00

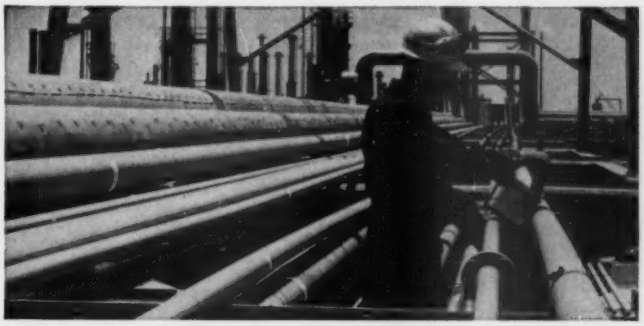
Composite Design— 12" W/F 27—810 lbs.	
Steel at 15¢	$121.50
80—¾" x 4" Studs at 45¢ installed	36.00
Cover Plate—391 lbs. steel at 15¢	58.50
Shoring	12.00
TOTAL	$228.00

will receive on-the-job training in Thailand's first modern, high efficiency steam power plant, which will serve Bangkok, the capital city, with a population of 1 million. Kuljian is consultant for the design, engineering, construction supervision, and initial operation of the $17.5 million power plant.

New members of the engineering and design staff of Jacobs Engineering Company, Pasadena, California, include: Dale L. Schrader, senior project engineer, from Southwest Potash Corporation; Russell E. Goodman, senior process engineer, from Bechtel Corporation; Joseph W. Gordy, project manager and construction superintendent, from The Ralph M. Parsons Company; Ora L. Underwood, materials handling and instrumentation engineer, from General Conveyor, Inc.; Warren E. McElroy, project engineer, from Ehrhart & Associates; William A. Day, chemical engineer, from Day and Zimmermann, Inc.; F. Waite Lukesh, construction superintendent and field project engineer, from Hydrocarbon Research, Inc.; William D. Hansman, from Dynamic Research, Inc.; William D. Krautter, from Ecsco Corporation; Francis L. Grosso, from The Ralph M. Parsons Company; Russell C. Richards, from Potash Company of America; H. Richard Betson, from The Ralph M. Parsons Company.

Meissner Engineers, Inc., Chicago, has announced the appointment of James A. Horstman as public relations director. An account supervisor with Mayer and O'Brien, Inc., prior to his appointment, Horstman also will be responsible for the corporation's advertising, sales promotion, and employee communications activities.

Rhuel A. Andersen and Lavern C. Koerwitz, consulting engineers, have announced that William H. Hawes, former district engineer for the American Institute of Steel



HANDLES 32% HCl AT AMBIENT TEMPERATURES—Workman is painting a section of Fibercast Pipe bearing 32% HCl at a Shell chemical plant. Note that Fibercast has sufficient strength for installation on span racks with the spacing normally used for metal pipe.

New pipes handle temperatures and pressures where no other pipes will do

WHAT is Fibercast?

It is a centrifugally cast, thermoset, epoxy resin reinforced pipe that handles temperature and pressure problems where no other non-metallic pipe will do. Its body of woven glass fibers resists high tension forces, is imbedded and bonded by heat in epoxy resin. Result: strong, long-lasting pipe that resists high pressure and temperatures in corrosive environments.

WHERE should Fibercast be used?

The petroleum industry . . . chemical . . . petro-chemical . . . nuclear energy . . . textile . . . paper . . . and food-processing industries . . . countless operations handling acids, alkalies, salt water and other corrosive liquids under pressure.

Wherever ease of handling, lightweight, dielectric properties and structural stability are desirable in a material that is at the same time outstandingly resistant to heat, pressure and corrosion.

WHY use Fibercast?

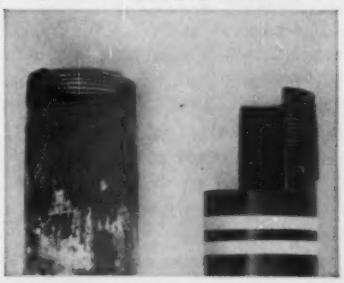
Because its advantages of superior resistance to heat, pressure and corrosion give Fibercast long service life that would alone justify choosing it over other materials.

Because even more expensive metal pipe or pipe with thermoplastic interior coatings cannot match Fibercast's proven durability.

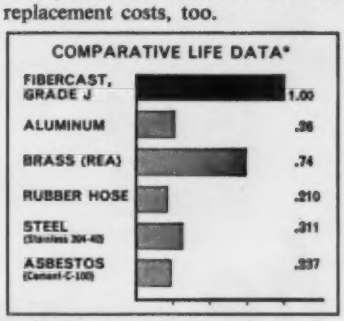
Because case histories and accurate testing have proved over and over again that Fibercast performs better, lasts longer, costs less.

Because out of 338 common corrosive solutions, Fibercast competently handles 320.

And, naturally, because Fibercast's unique and lasting qualities under such conditions mean that it drastically reduces maintenance and replacement costs, too.



Fibercast Tubing (right) used to suspend a 1,200 lb. pump for 3 years in a salt water supply well. *There was no loss in strength.* The damaged plastic-coated steel nipple (left) was used in the same installation, failed after 3 months service.



*Basing Fibercast as unit life of 1 and others as comparative percentages thereof.

Remember, also, that the three major systems of joining all pipe are used with equal success on Fibercast (standard flanged, cemented, and threaded and coupled), and with a complete selection of Fibercast Fittings. It's the world's largest line of corrosion-resistant epoxy pipe fittings!

Get the full story on Fibercast's cost-saving advantages to industry. Learn how it can help *you* solve your pipe and tube problems. Don't wait, mail coupon today!

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Please send me further information about Fibercast Tube and Pipe.

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Title _____

Firm _____

Type of Business _____

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City _____ Zone _____ State _____

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A DIVISION OF **Youngstown** SHEET AND TUBE COMPANY

Construction, has joined the firm as a partner. They will continue structural engineering, under the firm name of Andersen, Koerwitz & Hawes, in Denver, Colorado.

Russell L. Culp, formerly Chief of the Water Supply Section of the Kansas State Board of Health, has joined the engineering staff of Cornell, Howland, Hayes & Merryfield, consulting engineers. Located in the firm's Corvallis, Oregon office, Culp is working primarily on problems concerning water supply, treatment methods, and distribution systems.

CULP

SWITZER

George W. Switzer, Jr. has been appointed nuclear energy division manager of Gilbert Associates, Inc., engineering consultants, of Reading, Pennsylvania. Switzer, who joined Gilbert in 1948, will be responsible for all of Gilbert's engineering and design project work in the nuclear energy field.

Colonel J. D. Strong, USA, Ret., has been appointed field representative of the National Society of Professional Engineers. The originator of the Army's professional engineer preparatory courses for qualified personnel of the Armed Services who want to become registered, Colonel Strong will assist state societies and chapters in an expanded program of orientation and information on NSPE's major objectives and activities.

Edmond A. Siebert, Jr., has been elected vice president in charge of sales at Meissner Engineers, Inc., of Chicago. In announcing Sie-

the only maintenance this service-entrance switch ever needs

Pringle service-entrance switches do not freeze, rust or suffer fatigue. Nor do they wear out.

We know — from the number of units that have been in continuous operation for more than 25 years, without requiring a spare part or giving reason for complaint.

Closed, the Pringle service-entrance switch is the next best thing to bolted bus bars. Its contacts are bolted together under a constant, springless pressure unaffected by either heat or time. This means greater current-carrying efficiency. Under a continuous full-rated load, contact temperature never reaches 30°C. above ambient, even with the fuses in place.

The Pringle switch breaks loads with the same facility that it carries them. To open this switch manually against load requires less than the full power of a normally-muscled male arm — even after 15 years of continuous closed operation, or against any size overload that allows time for manual operation. Higher overloads are automatically interrupted by high-capacity, current-limiting fuses. The fuses don't need any maintenance either.

For additional information on the essential service-entrance requirements as well as the performance of Pringle equipment, write for Bulletin 601, "Facts You Should Know About Service-Entrance Equipment".

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bert's election as an officer of the company, President Robert C. Meissner said the position had been created as another step in the firm's expansion program, to further increase coordination of sales efforts between MEI's various divisions, and to focus executive responsibility on the company's accelerating client service activities.

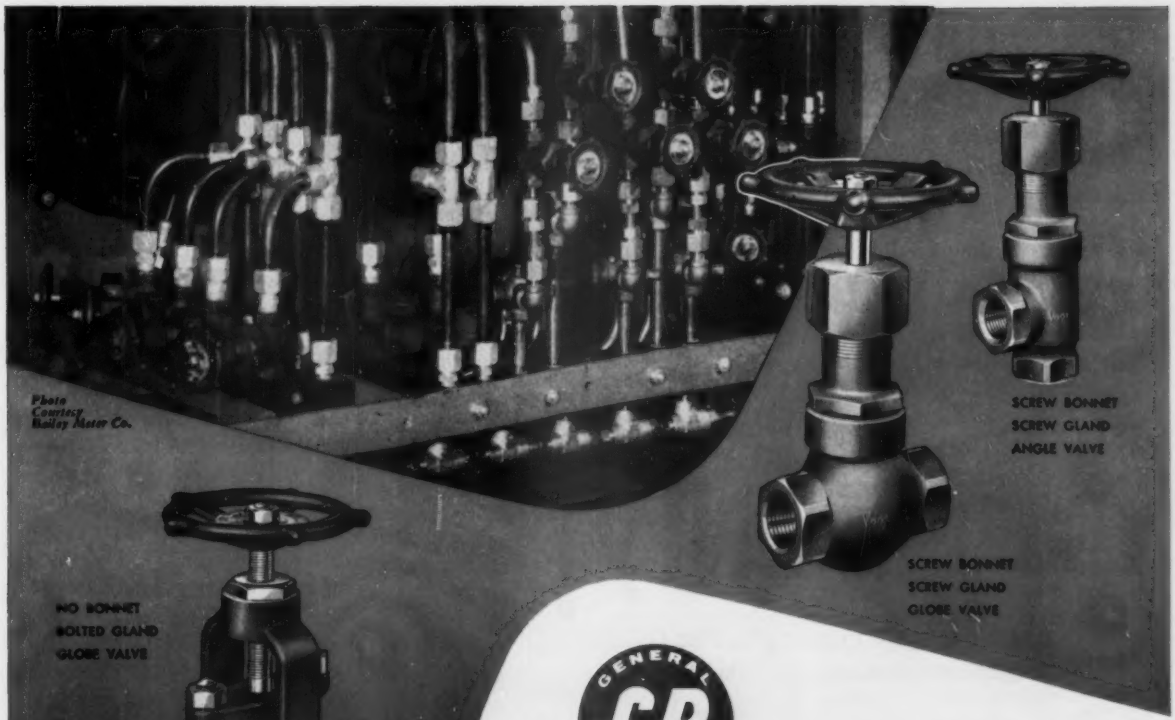
William Robert Scherwat has resigned as field engineer with the Portland Cement Association to accept a position with Engineering Service Corporation, architect-engineers, of Decatur, Illinois.

Lockwood, Kessler & Bartlett, Inc., Syosett, New York, civil engineering consultants, and Raymond & May Associates, Pleasantville, New York, community planning consultants, have announced a new comprehensive service designed to assist communities in solving growth and modernization problems. As a result of pooling the many talents of the two respective organizations, communities now have available to them from a single source a comprehensive engineering service embodying community planning, zoning, urban renewal, public works design, and the related construction supervision.

Ferguson-Gates Engineering Company, consulting engineers of Beckley and Charleston, West Virginia, has changed its name to Gates Engineering Company.

Cummins & Barnard, Inc., consulting engineers of Ann Arbor, Michigan, has opened a branch office in the California area, through professional association with Matson Associates, Consulting Engineers, 14568 Whittier Boulevard, Whittier, California.

William H. Gropp, widely known in engineering throughout the West, has been named chief mechanical-electrical engineer for Wilsey, Ham & Blair, Engineers &



GENERAL GP PURPOSE

FORGED STEEL *INTEGRAL SEAT* METER AND GAUGE LINE VALVES

Union Bonnet, Screw Bonnet and No Bonnet Types

Service proved Vogt GP Forged steel valves are the choice of leading meter and gauge Manufacturers for top performance and unfailing reliability.

They are available in sizes from ¼" to 2" of carbon steel for general purpose duty and of all-stainless where highly corrosive liquids are involved. All stems are one-piece 13% Chrome Stainless Steel with fine pitch threads for accurate regulation of flow. Special packing is furnished when specified.

Catalog F-10 contains the complete Vogt line of valves, fittings, flanges and unions. Available upon request on your letterhead. Address Dept. 24A-FCE

HENRY VOGT MACHINE CO., P. O. Box 1918, Louisville 1, Ky.

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Vogt FORGED STEEL **VALVES, FITTINGS, FLANGES and UNIONS**

Planners, of Millbrae and Los Angeles. Gropp's appointment completes the firm's fully integrated engineering-architectural-planning staff, which directs all phases of industrial design and construction supervision.

New officers of the Consulting Engineers Association of Belgium are: president, P. G. Liegeois; vice presidents, F. Piret and J. Trenteseau; secretary general, L. Culer; treasurer, S. Tutundji; members, J. Soubre, A. Vandendriessche, M. Van Wetter, and R. Fostroy.

The firm of Milton Alpern, P. E., Consulting Engineer, announces the removal of its Long Island office to the Wantagh Professional Building at 2079 Wantagh Avenue, Wantagh, New York.

John R. Coffin, senior vice president, has been named president of Jackson & Moreland, Inc., Boston consulting engineering firm.

George H. Miehls, chairman of Albert Kahn Associated Architects and Engineers, Inc., Detroit, was one of the speakers at the Industrial Building Congress held in New York City recently. Subject of Miehl's talk was "Developments in the Use of Structural Steel."

Nine new officers of the American Society of Civil Engineers for 1961, headed by president-elect Glenn W. Holcomb, of Corvallis, Oregon, have been announced at Society headquarters following canvass of a mail ballot of the 46,000 membership. Holcomb, head of the department of civil engineering at Oregon State College, is the 92nd president of the society.

Other officers elected include two vice presidents, each of whom will serve a two-year term: Donald H. Mattern, of Knoxville, Tennessee, vice president for ASCE's Zone II, and William J. Hedley, of St. Louis, Missouri, vice president for ASCE's Zone III.

Techint Incorporated, a Division of Techint Engineering Co., Inc., has moved its New York offices to 270 Park Avenue, Union Carbide Building.

John E. Stephens & Associates, engineers and architects, has moved its office to Suite 308, Mayer Central Building, 3033 N. Central Avenue, Phoenix, Arizona.

The board of directors of Pioneer Service & Engineering Company, Chicago, announces the election of W. C. Drummond as president of the company to succeed Fred C. Kellogg, deceased. Drummond has been with Pioneer and its predecessor, Byllesby Engineering, since 1925, starting as a mechanical engineer. He became chief engineer in 1945 and was elected vice president in charge of engineering in 1953. ▲▲

Parallel Reading

If You Buy Books . . .

To buy books reviewed here, or any other books, technical or general, fiction or fact, give us title and author, and your check if you know the price . . . or we will bill you.

Book Editor
CONSULTING ENGINEER
Saint Joseph, Michigan

It's The Law, by Bernard Tomson; Channel Press, Great Neck, N. Y.; $7.50.

Here is an important book for the consulting engineer's legal library. It was developed from the author's monthly column in *Progressive Architecture* magazine, and includes a great deal of previously unpublished material. It is one of the few books which covers the entire range of legal problems encountered in the construction industry in layman's language.

Judge Bernard Tomson, before his appointment to the bench in Nassau County, New York, was an attorney specializing in real estate and architectural and construction law. He is widely respected in the architectural profession, and most of his material is equally applicable to the practice of consulting engineering. The book opens with a discussion of the statutes regulating private practice and also deals with the problems of registration, licensing, and practice in foreign states. The following section deals with organization and business problems and is followed by a section on the employment relation between architects, engineers, contractors, and owners. A fourth section deals with the rights and liabilities of architects, engineers, and contractors, and the final section is devoted to restrictions upon the use of property. Restrictive covenants and zoning are well covered.

•

Industrial Development, by Murray D. Bryce; McGraw-Hill Book Co., Inc., New York, N. Y.; $7.50.

For the consulting engineering firm ready to seek out overseas

projects, this book is an invaluable guide. In great detail, it covers the steps that must be taken to start an industrial development that will accelerate the economic growth of a developing country. Because it places engineering in the proper relationship with economic, political, and other factors, it will be a great help to the engineer who must evaluate the significance and possible chance of success for overseas projects.

Above and beyond its specific value to the engineer about to embark on a program of foreign work, *Industrial Development* is a book which can, and probably will, do much for the profession of consulting engineering in general. Certainly, Mr. Bryce is well aware of the importance of the consulting engineer, and does not hesitate to give him his due. This is something consulting engineers have come to expect only occasionally, if at all.

Murray D. Bryce is a Canadian economist who has spent six years with the World Bank and almost three as an economic advisor to the Government of Burma. He is now on the staff of the Arthur D. Little industrial research and consulting organization in Cambridge, Massachusetts, working on economic development projects in various countries. Much of his appreciation of consulting engineers may logically be credited to this background. However, since Canada has shown great interest in its professional engineers in private practice, at least on the government level, we can probably credit much of Mr. Bryce's sympathetic understanding to the simple fact that he is a Canadian.

•

Seven Against the Night, by Paul Eldridge; Thomas Yoseloff, New York, N. Y.; $6.00.

What James Kip Finch is doing in the pages of CONSULTING ENGINEER for the great minds of engineering, Paul Eldridge has done for seven classic scholars of the past. His

If your sewer pipe is heavy . . . takes too long to install . . . and will rust, rot or corrode . . . then you're taking plenty of underground losses . . . in actual installation costs and in customer good will.

Bermico *Life-Guarded* Fibre Pipe will save you and your customers time, trouble and money. Bermico is light in weight . . . goes down fast . . . is chemically fortified to assure extra long, trouble-free service.

We'll *prove* these advantages to you . . . with on-the-job facts and photos . . . in our new *Bermico Proof Book*. Send for your copy to Dept. CE-2.

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OUTLASTS A LIFETIME

book deals with the life and philosophy of Erasmus, Machiavelli, Montaigne, Diderot, Beaumarchais, Schopenhauer, and France as they struggled to bring learning into an unlearned age. Why these seven should be put together can best be expressed by Eldridge:

"The Seven Against the Night differed from one another in temperament and in manner, and their careers were diverse. Some were illustrious and rich; others poor and ignored. All of them, however, suffered in one way or another for their ideas, and while not one mounted the scaffold or was bound to a stake, each felt the ugly breath of bigots and sadists, and three rotted in dungeons for various periods of time.

"And all of them have become classics – that is, their names are often invoked, but their works rarely read."

This book is no *Reader's Digest* guide to the classics. However, for the busy engineer whose education and vocation leave him little time for the liberal arts, it can be a worthwhile experience. In fact, the book may prove interesting enough to spur many readers into further research on the lives of these great men whom so many of us quote with such little authority.

•

The Image of the City, by Kevin Lynch; The Technology Press and Harvard University Press, Cambridge, Massachusetts; $5.50.

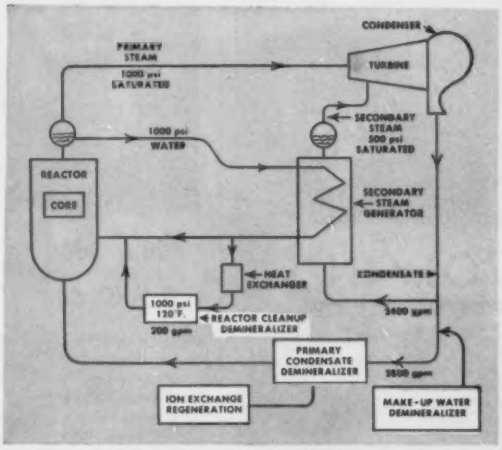
Kevin Lynch has tried to establish criteria for determining the "imageability" of any city, through a study of 3 particular cities – Boston, Jersey City, and Los Angeles. The cities are described as seen by the people living in them. There are many faults to be found with the book, or the study which prompted it, but, like the famous crap game, it's the only one around.

The author and his assistants spent several years in the preparation of the book, interviewing residents of the cities, correlating other

High-Purity Water Made Possible with Nalcite Ion Exchange Resins

Dresden Boiling Water Reactor System has Unusual Demineralization Needs

Water purity in a degree not even considered a few years ago is required at the Dresden Plant of Commonwealth Edison Company in Northern Illinois. Nalcite Ion Exchange Resins have been chosen for the condensate high flow, reactor cleanup, and waste treatment demineralization units, one of which has an unusual system for removal, regeneration and re-placement of exchange resins.



Simplified diagram of the Dresden Boiling Water Reactor steam condensate system. Nalcite resins are used in condensate high flow, reactor cleanup and waste treatment demineralizing units.

Condensate High-Flow Demineralizer

2,800 gpm condensate, returning to the reactor from the turbine condensor, passes through the primary system demineralizer at flow rates of 70 gpm/sq. ft. of bed area. This demineralizer is designed to remove more than 1,000 lbs. of dissolved and suspended impurities from the condensate each year.

Resin Removed for Regeneration

To prevent cross-connections between the reactor and regeneration piping, equipment was developed for external regeneration of the ion exchange resins. This is accomplished by semi-fluid pressure transfer.

Nalcite HCR-W and SBR-P in the primary condensate demineralizer have the high degree of sphericity and ion exchange ability essential to high flow rate service at minimum pressure drop. They also have the resistance to attrition which permits resin transfer from the demineralizer to separate regeneration units and back, repeatedly . . . without measurable bead breakage.

Reactor Cleanup Demineralizer

The reactor cleanup demineralizer on the return side of the secondary steam generator system handles 200 gpm condensate at 1000 psi, 120° F. On-line and standby units have flow rates of 10 gpm/sq. ft. of bed area. Exhausted resins are radioactive, and are replaced with new resins, rather than regenerated.

Waste Treatment Demineralizer

Radioactivity in wastes is concentrated by the waste treatment demineralizer. Exhausted resins are radioactive and are sluiced from the units and prepared for disposal.

Make-Up Water Demineralized

Very small quantities of make-up water are required, due to painstaking design to eliminate condensor leakage, and other system losses. Conventional demineralizers, followed by mixed-bed polishers, provide make-up water.

Ideas for the Future

While operating temperatures and pressures at the Dresden Plant are nominal in modern steam generation practice, the special requirements for high flow and water purity from demineralizers in the steam-condensate system may have practical application outside nuclear reactor technology. It is significant that Nalco had ready, in Nalcite HCR-W and Nalcite SBR-P, ion exchangers which make possible these unusually severe ion exchange applications.

Ideas for Today

For busy engineers and technical men, Nalco has prepared concise data on water conditioning with Nalcite cation and anion ion exchange resins: Bulletins Z-12 and Z-13, free on request. If you want fast action on a specific water treating problem, Nalco experts are available on short notice. Call or write.

NALCO CHEMICAL COMPANY
Ion Exchange Division
6180 West 66th Place — Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany. In Canada: Alchem Limited, Burlington, Ontario.

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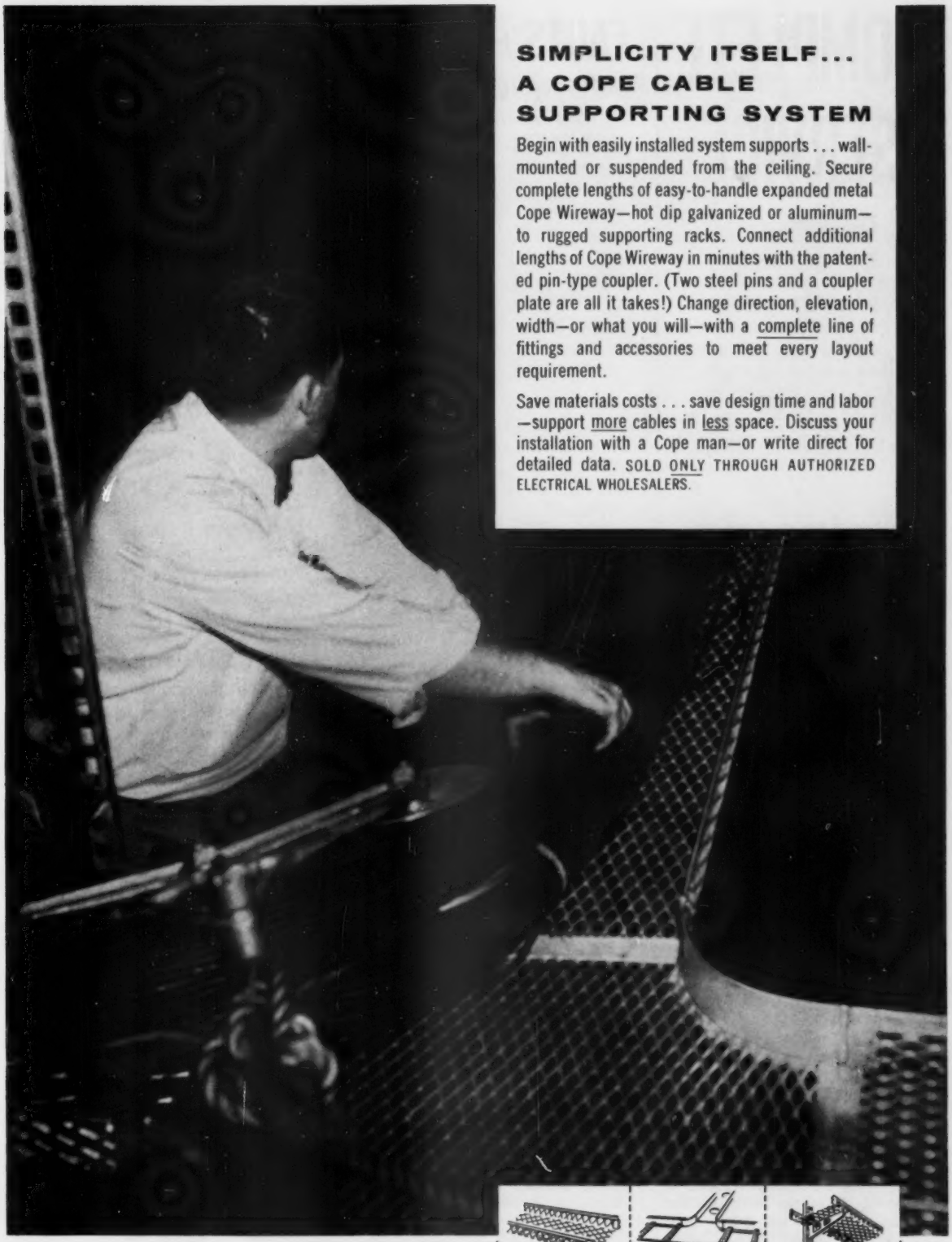
data, and interpreting the results. They found that there are definite factors which serve to identify a city or a section visually. These are the elements which evoke a strong image in the viewer, hence the term "imageability." The components of this imageability are: paths – channels of motion within the city; edges – lateral references or linear elements not used as paths; districts – larger sections having two-dimensional extent; nodes – internal reference points, as a crossing of paths; and landmarks – external reference points, as a tall building.

The book studies the success or failure of three cities in identifying themselves strongly in the minds of the inhabitants. It is unlikely that the book will be recommended by the Chamber of Commerce in any of the cities; it certainly should be recommended to the planning boards in each of the cities. In the words of residents, Boston is distinctive but confusing, dirty, congested; Jersey City is formless, uncoordinated, lacking in character; Los Angeles is faceless, undifferentiated, decentralized. But to read the book with the idea of specifically studying one of these cities would seem to defeat the author's purpose. This is a first attempt, written as a key to further study. It does not pretend to be more.

To the author's credit, he recognizes most of the failings, many of them the fault of the sampling procedure. The number of subjects interviewed is infinitesimal compared to the population: 30 in Boston, 15 each in Jersey City and Los Angeles. The subjects were mostly in the white collar, upper middle class, and cannot be supposed to have given a true picture of the overall impression of the city. One factor, which may or may not be judged a fault, is the author's concern with the appearance of the elements of the city, without regard for their functional aspects. It is possible that the effectiveness of a landmark as a place for work,



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Begin with easily installed system supports . . . wall-mounted or suspended from the ceiling. Secure complete lengths of easy-to-handle expanded metal Cope Wireway—hot dip galvanized or aluminum—to rugged supporting racks. Connect additional lengths of Cope Wireway in minutes with the patented pin-type coupler. (Two steel pins and a coupler plate are all it takes!) Change direction, elevation, width—or what you will—with a complete line of fittings and accessories to meet every layout requirement.

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or of a path as a route to work, may color the subject's image as much as the physical appearance of the building or the street.

•

New Technical Books

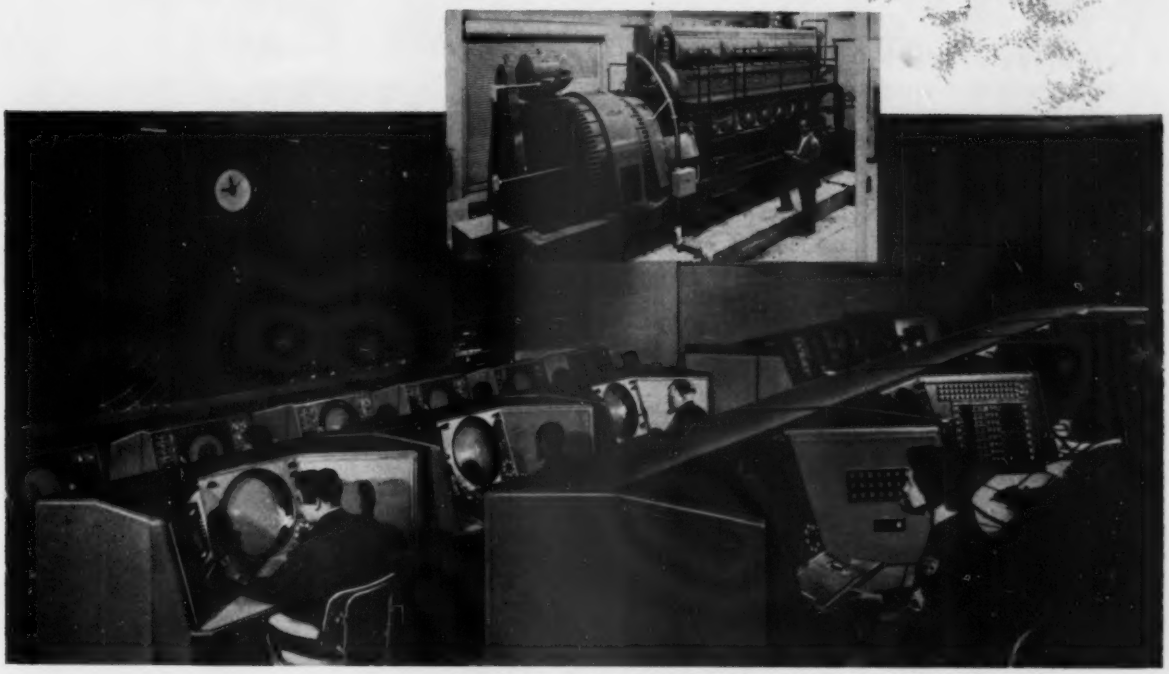
THERMOELECTRIC MATERIALS AND DEVICES, edited by Irving Cadoff and Edward Miller; Reinhold Publishing Corp., New York; $9.75. A series of lectures at New York University was the basis for this book, which covers the field of thermoelectricity from basic theory through device design. The 19 chapters include a general evaluation of material and descriptions of recent experimental equipment. At critical points, the authors – 20 of them – have included reviews of background data.

EMBRITTLEMENT BY LIQUID METALS, by Rostoker, McCaughey, and Markus; Reinhold Publishing Corp., New York; $7.95. Through an examination of all available information on the subject, the authors have formed what they feel is a new approach to embrittlement by liquid metals. Modern dislocation theories of brittle fracture are the basis for most of their findings. The book should be of special interest to engineers concerned with the design of liquid metals systems.

ENGINEERING THERMODYNAMICS, by Newman A. Hall and Warren E. Ibele; Prentice-Hall, Inc., Englewood Cliffs, N. J.; $10.50. The Second Law of Thermodynamics, which dictates the direction of all energy transformations, is the principal subject of this book. The authors present an analysis of all the aspects of modern thermodynamics, with extensive footnotes and appendices. There are also helpful summations at the beginning of each of the 19 chapters.

LINEAR CIRCUITS, by R. E. Scott; Addison-Wesley, Reading, Massachusetts; Vols. I and II, $6.75 each.

WHITE SUPERIOR ENGINES



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Missile Master joins a growing, impressive list of Superior-powered U.S. defense assignments that are convincing evidence Superior engines provide rugged dependability, trouble-free performance and economical fuel consumption. Superior engines —215 to 2150 HP or 150 to 1500 KW—will also meet your exact power requirements. Write today for complete information.

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White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

Doctor Scott, Professor of Electrical Engineering at Northeastern University, presents the methods of linear circuits as a basis for the complete structure of electrical engineering. Essentially a textbook, the work is divided into two volumes. Volume I, *Time-Domain Analysis*, treats basic theory; Volume II, *Frequency-Domain Analyis*, deals with network system functions, the uses of Fourier series, Fourier integrals, and power density spectra for general input functions.

THE CONTROL OF MULTIVARIABLE SYSTEMS, by Mihajlo Mesarovic; The Technology Press – MIT, and John Wiley & Sons, New York; $3.50. Suggesting that the theory of controls systems should rest on a multi-variable rather than a single variable foundation, the author recommends specific control systems. Doctor Mesarovic, head of the Control Division of the Belgrade Technical University, is one of Eastern Europe's foremost scientific minds.

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Bulletins

¶ The Ohio River Valley Water Sanitation Commission has released its 12th annual report on the progress of antipollution measures in the eight states of the Ohio River Valley. The report indicates that substantial improvement has been made. Copies can be obtained from the pollution control agencies in the sponsoring states, or from ORSANCO, 414 Walnut Street, Cincinnati 2, Ohio.

¶ The Atomic Industrial Forum has published *Atoms for Industry World Survey*, a report on the world-wide status and prospects for commercial applications of atomic power. The book is available at $3 from Atoms for Industry, 225 Lafayette St., N. Y. 13, N. Y.

¶ Latest publication by the Highway Research Board is *Bulletin 256*, "Urban Research–1960." The report includes five papers studying the problems of increased traffic and sprawling cities. Specific topics include drastic rezoning techniques and population density control. The publication is available at $0.80 from the Highway Research Board, 2101 Constitution Ave., N.W., Washington, D.C.

¶ The National Bureau for Lathing and Plastering has released a new *Manual of Lathing and Plastering*, written by John R. Diehl, AIA. The manual – a joint venture by trade unions, plastering contractors, and manufacturers of building materials – will be distributed without charge to a limited number of architectural and engineering firms. Inquiries regarding the manual and its distribution should be directed to John Buster, executive Director, National Bureau for Lathing and Plastering, 2000 K St., N.W., Washington 6, D.C. ▲▲

Consulting Engineers' Calendar

Feb. 9-11. National Society of Professional Engineers; Winter Meeting of the Board of Directors, Hotel Fort Des Moines, Des Moines, Iowa.

Feb. 13-16. American Society of Heating, Refrigerating & Air-Conditioning Engineers; 15th International Heating, Refrigeration & Air-Conditioning Exposition, International Amphitheatre, Chicago, Illinois.

Feb. 19-23. American Society of Civil Engineers; Regional Convention, Texas Agricultural & Mechanical College, Houston, Texas.

Feb. 20-23. American Concrete Institute; 57th Annual Convention, Chase-Park Plaza Hotel, St. Louis, Missouri.

Feb. 26-March 1. American Institute of Chemical Engineers; National meeting, Roosevelt Hotel, New Orleans, Louisiana.

Feb. 26-March 2. American Institute of Mining Engineers; Annual Meeting, the Chase-Park Plaza Hotel and the Ambassador Hotel, St. Louis, Missouri.

March 5-8. Third National Lighting Exposition and World Lighting Forum, New York City Coliseum, New York, New York.

March 5-8. American Road Builders' Association; Annual Convention, Haddon Hall, Atlantic City, New Jersey.

March 5-9. American Society of Mechanical Engineers; Gas Turbine Power Conference & Exhibit (the U.S. Department of Defense is serving as co-sponsor), Shoreham Hotel, Washington, D. C.

March 16-17. University of Arizona; Conference on Data Processing Problems, Campus, Tucson, Arizona.

March 28-29. Connecticut Building Congress; First Construction Exposition and Symposium, Statler Hilton, Hartford, Connecticut.

April 5-7. American Institute of Electrical Engineers; Southeast Meeting, New Orleans, Louisiana.

April 9-13. American Society of Mechanical Engineers; Oil & Gas Power Conference & Exhibit, Jung Hotel, New Orleans, Louisiana.

April 10-14. American Society of Civil Engineers; Convention, Hotel Westward Ho, Phoenix, Arizona.

May 1-3. Electric Association of Chicago; Lighting Exposition, McCormick Place Exposition Center, Chicago, Illinois.

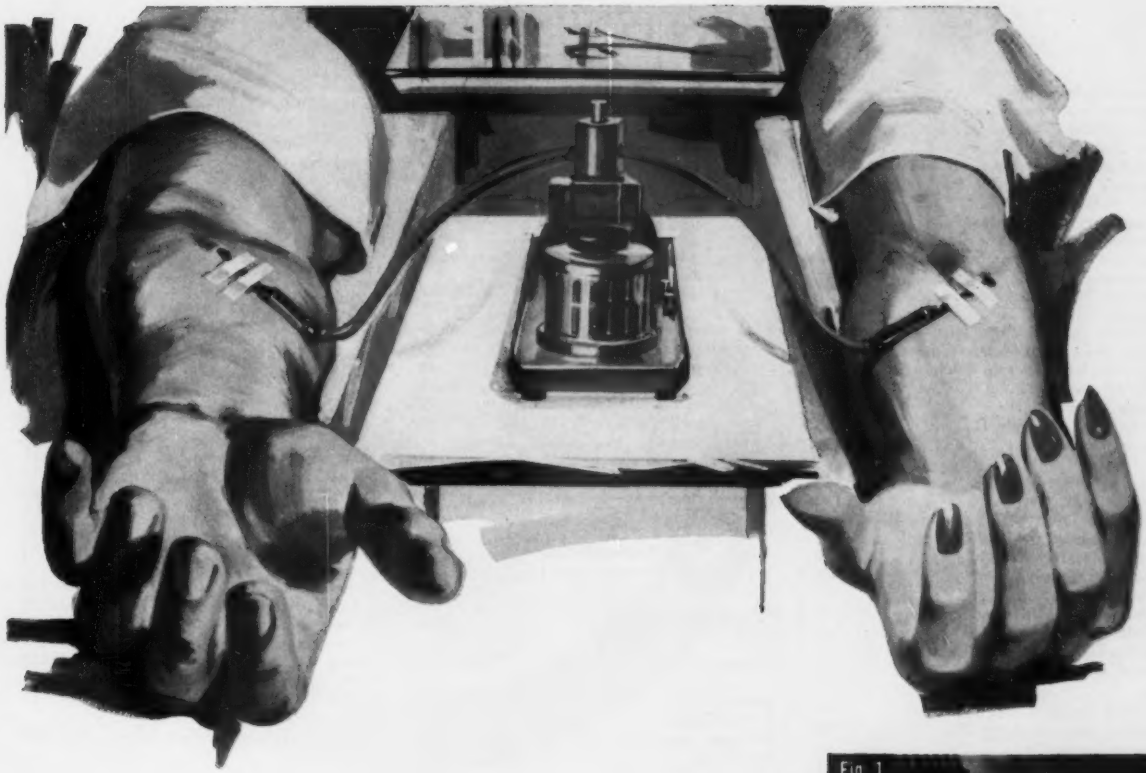
May 7-10. American Institute of Chemical Engineers; Meeting, Sheraton-Cleveland, Cleveland, Ohio.

May 16-18. Building Research Institute; Spring Conferences, Shoreham Hotel, Washington, D. C.

June 6-8. West Virginia University; Sixth Annual Appalachian Underground Corrosion Short Course, Campus, Morgantown, West Virginia.

June 11-15. American Society of Mechanical Engineers; Semiannual Meeting, Statler-Hilton Hotel, Los Angeles, California.

June 18-23. American Institute of Electrical Engineers; Summer General Meeting, Ithaca, New York.



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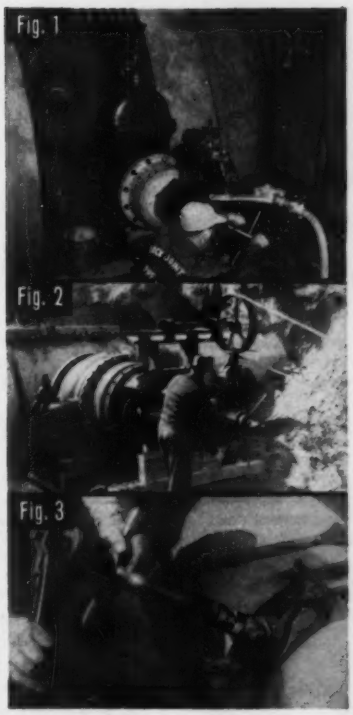
The method of tapping Lock Joint Concrete Pressure Pipe has been developed to a high degree of ease and efficiency. Of the thousands of taps made in various designs and sizes of this pipe, all have been effected with absolutely no damage to the structure of the pipeline.

Whether the job calls for a cross connection for a 150″ aqueduct (fig. 1), a 42″ outlet in a 60″ transmission main (fig. 2), or a ¾″ service connection in a 20″ transmission main (fig. 3), Lock Joint Concrete Pressure Pipe may be tapped economically and with complete assurance.



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ADVERTISERS' INDEX

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These are but a few examples of hundreds of PLATECOIL which have been especially formed and fabricated to meet a processing or manufacturing requirement. Today, in addition to standard styles (which in themselves offer a broad range of application possibilities) PLATECOIL can be rolled, formed and shaped to satisfy rigid requirements of space, configuration, weight and materials.

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Operating pressure up to 250 psig. Safety factor 5 to 1. Available in stainless steel, mild steel, Monel, Nickel, Inconel, Ni-O-nel, and Hastelloy B, C, and F or other weldable materials on special order.

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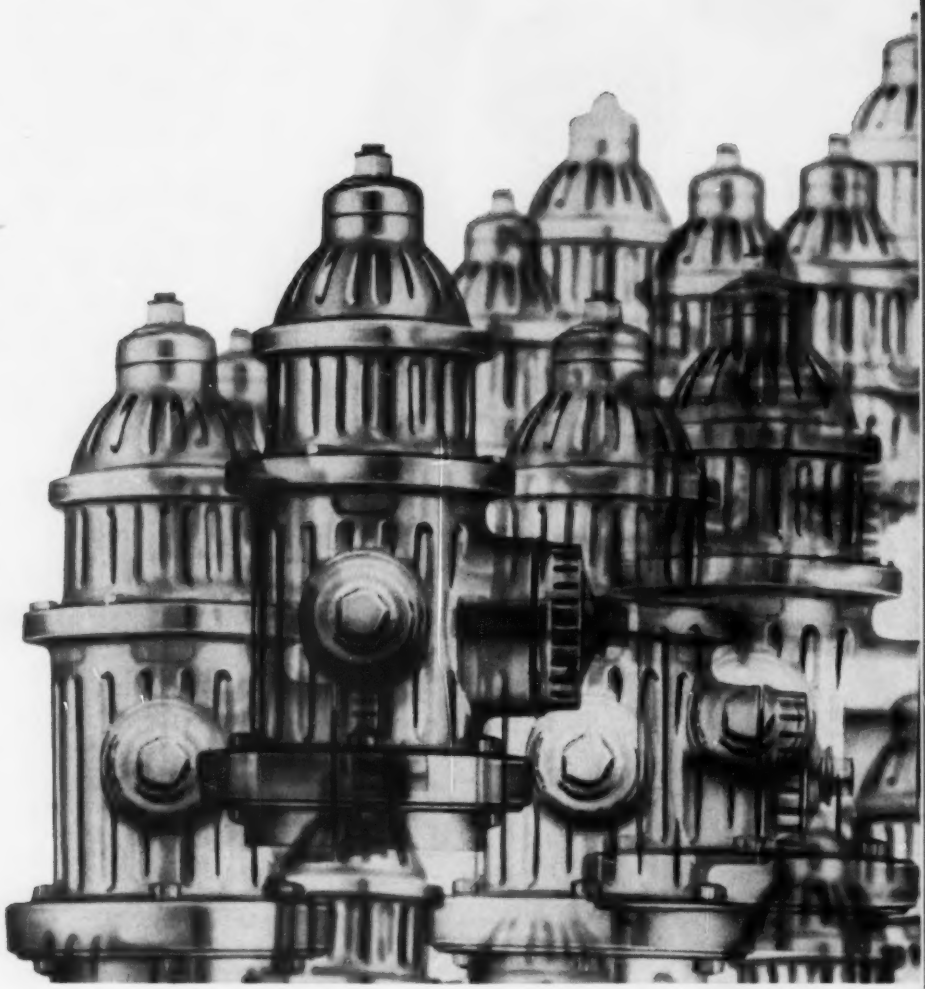

Reasons? Over a million hydrants now in service throughout the world. A number like that speaks for itself, says plenty about the outstanding features of the hydrant and the excellent service and reliability you can expect with R. D. Wood products.

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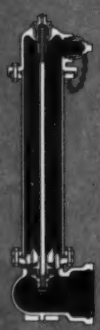
R. D. Wood Mathews Flange Barrel Hydrant . . . dry head construction keeps it operating in every kind of weather.



R. D. Wood Swivel Joint Hydrant can be faced in any direction.

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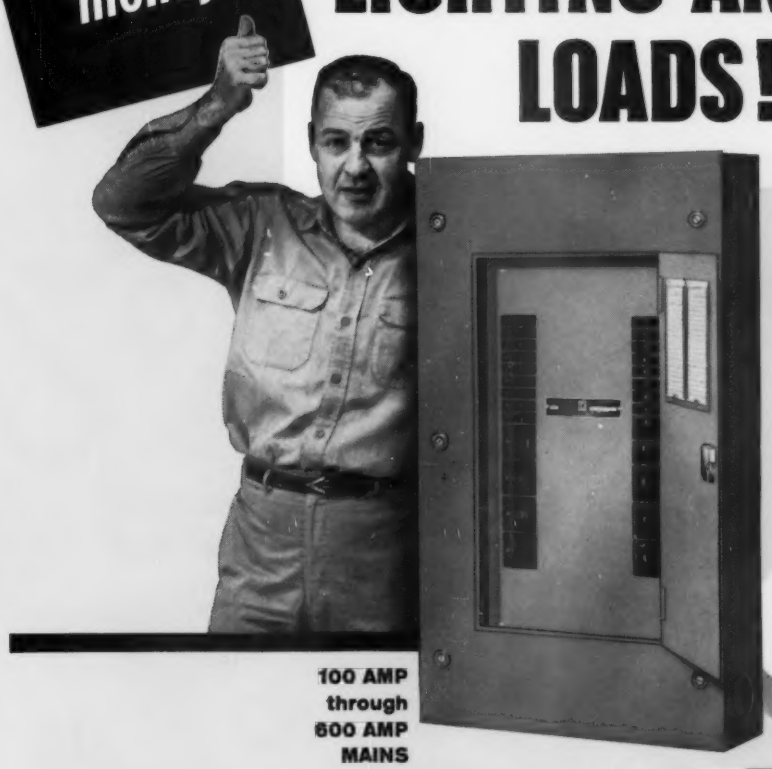

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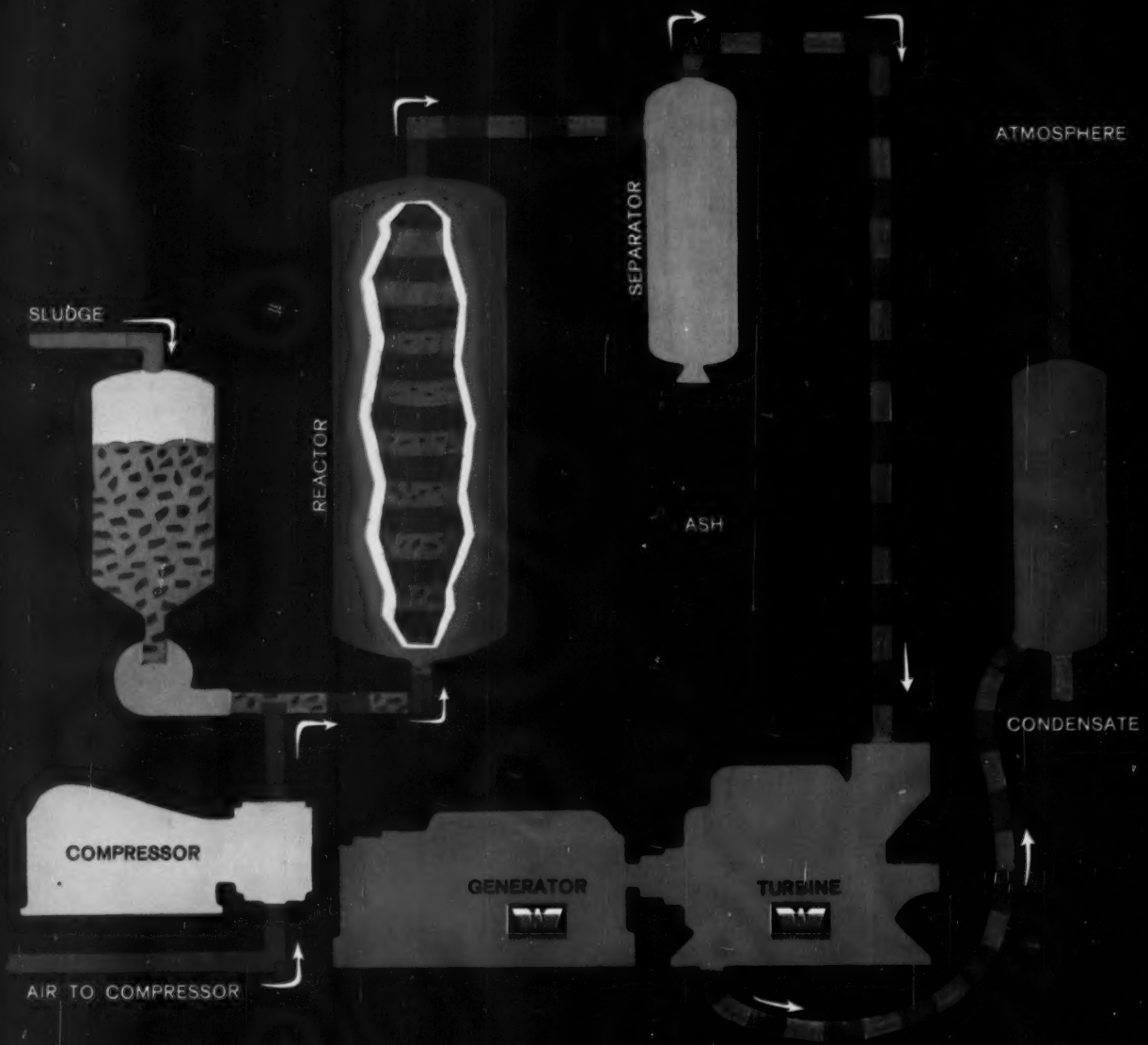
wherever electricity is distributed and controlled



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In Chicago a $12 million plant built on this Zimmermann Process* will dispose of 200 tons a day (dry basis) of sewage sludge. But the process runs equally well on many industrial organic wastes; for example, waste pulp liquor from a pulp mill and on much smaller tonnage than the large Chicago installation.

Key factor in process efficiency is the direct power recovery from gas-steam mixture produced by the reaction. In the Chicago installation, this mixture will drive a Worthington 12,500 kw. turbine generator.

Why was the Worthington turbine generator unit chosen? Because Worthington turbine specialists lead in designing turbines for power recovery from any gas mixture, including the gas-steam produced here. Because a Worthington generator has quality not exceeded by any other generator manufacturer today. And because of Worthington's reputation for extreme reliability in the industrial turbine field.

For further information about any power recovery turbine application, write or call Worthington Corporation, Turbine Division, Dept. 48-13, Wellsville, New York.

*The Zimmermann Process is patented and licensed by Sterling Drug Inc., N. Y. C., N. Y.

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PRODUCTS THAT WORK FOR YOUR PROFIT

PART 2

2

Consulting Engineer

DIRECTORY OF ADVERTISERS' LITERATURE

Keep This Directory

in Your

Technical Reference File

ST. JOSEPH, MICHIGAN

Part 2

February 1961

Consulting Engineer

Wayne near Pleasant Street
Saint Joseph, Michigan

Dear Reader:

Here is your first 1961 issue of CE's directory of manufacturers' bulletins.

In it are 663 items of product literature . . . with specs, photos, and schematics.

Bring your catalog file up-to-date. Select the bulletins you need and ring the corresponding numbers on the card found between pages 16 and 17 and pages 48 and 49. Tear it out and mail it to us, postage paid.

In a few days the items you want will be on their way to you from the respective manufacturers.

Cordially,

Cullen S. Child

CULLEN S. CHILD
Merchandising Director

AIR CLEANERS & DUST COLLECTORS

1—Automatic Dust Arrestors

An entirely new, more complete brochure describing Norblo automatic bag type dust arresters. Identified as Bulletin 164-6 the eight pages are fully illustrated. Continuous operation at full capacity is explained as it applies to both pneumatic and mechanically operated cleaning systems. Dimensions, capacities.

Northern Blower Div., Buell Engrg. Co.

2—Disposable Media Air Filters

Bulletin B-1400-8 describes Farr's *Roll-Kleen* V-7 air filters. These filters effectively clean air by means of a disposable filtering media. Various models are illustrated and advantages given. Information on construction, operation, installation, maintenance, and performance. Dimensions and capacity tables included.

Farr Co.

3—Dust Collection Case Studies

Bulletin Series No. 740 describes dust collection problems in a variety of industries. These problems and their solutions range from single unit installations to complete systems, and from heavy industrial applications involving grinding, buffing, polishing, and woodworking, to the collection of lint.

Aget Manufacturing Co.

4—Cube-Type Air Filters

The advantages of Union Carbide's new *Ulok* open-side, cube-type, filters are outlined in this four page Bulletin B. Complete description of the *Dynel* modacrylic fiber media is included, as well as details of efficiency, space saving, and reduced maintenance costs. Featured is an exploded view of filter assembly.

Union Carbide Development Co.

5—Air Purification Equipment

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

Connor Engineering Corp.

6—Dust Filtering and Collection

Bulletin 2131-M83 describes the new Koppers Model K *Aeroturn* reverse-air jet dust filter for virtually 100% efficiency in dust filtering and collection. Bulletin illustrates the uncomplicated design, with drawings and photographs to show prefabricated sub-assemblies, flexibility, ease of erection. All features shown.

Koppers Co., Inc., Dust Filter Dept.

7—Industrial Dust Collectors

Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self-contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.

8—Control of Dust and Fumes

Catalog G-100 describes precipitators, collectors, filters, scrubbers, processors, and heaters for controlling industrial dust and fumes. Various products are fully described. Illustrations show product and installations. Cutaways and line drawings show construction and operation. Many applications pictured.

Western Precipitation Div. Joy Mfg. Co.

9—Mist Eliminators

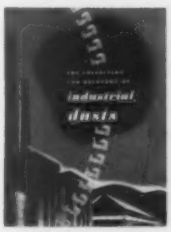
Industrial products bulletin, SM-4.12-60, "Cost Saving Ideas for the Paper Industry" describes ideas for cutting costs and solving nasty air pollution problems through the use of *Metex Hi-Thruput* mist eliminators in the pulp and paper industry. Line drawings show types of installations.

Metal Textile Corp., General Cable Corp.

10—Cyclone Dust Collector

Bulletin 140 describes the John Wood cyclone collector for industrial dust collection. Cutaway shows construction and operation. Advantages are outlined and complete dimensional data include line drawings. Volume-draft loss nomograph and typical collection efficiency curves are shown.

John Wood Co.



11—Collecting Industrial Dusts

Bulletin 101 discusses methods of collecting industrial dusts. Describes dust; gives typical sources; shows tests that are made to determine proper application. Gives data on cyclones, electric precipitators, low resistance collectors, low draft loss collectors, dry classifying systems, special collectors, and others.

Buell Engineering Co.

12—Electrical Precipitation

Bulletin AI-101 outlines the development and basic steps of electrical precipitation. Deals in detail with charging, precipitating, and discharging the dust particles. Includes discussion of the back-ionization problem. Two types of suggested energy sources, silicon and electronic, are also described. Illustrated.

Aerotec Industries, Inc.

AIR CLEANERS & DUST COLLECTORS *continued*

13—Reverse Jet Dust Collector

Bulletin 279C describes AAF Model B *Amerjet* dust collector, designed for applications where extremely fine particles are involved and where material must be collected in dry state. Construction features, operating principle, selection of bag fabrics, application data, dimensions, and selection nomograph.

American Air Filter Co., Inc.

14—Automatic Dust Collector

Bulletin FM60 describes new line of Torit fully automatic continuous operating dust collectors. Available in ranges up to 60,000 cfm and higher, these collectors are of extremely high efficiency, yet weigh less than one-half of standard equipment due to their aluminum construction. Illustrations show application.

Torit Mfg. Co., Automatic Division.

15—Electric Precipitators

Bulletin 104 describes electric precipitators manufactured by Buell Engineering Company. Line drawings show principle of operation and cutaway shows construction. The many features of this equipment are enumerated. Illustrations show installations in various types of industry. Nine installation steps given.

Buell Engineering Co.

16—Dust and Mist Collectors

Bulletin 736 illustrates the entire Aget line and includes complete dimensions and specifications. Forty basic *Dustkop* units will collect everything from wood chips to fine dust particles. Also 4 *Mistkops*, 4 *Filterkops*, 2 *Dustbusters*. Descriptive copy and recommended uses for models. Photographs of installations.

Aget Manufacturing Co.

17—Air Hygiene

Bulletin K-856 analyzes problems of micro-organisms in industrial processing plants and hospitals. Solution with *Kathabar* equipment is offered. *Kathabar* systems destroy 97% of bacteria and mold in hospitals, food and chemical plants, and maintains specified humidity conditions, Two bulletins will be sent.

Surface Combustion.

18—Panel-Type Air Filters

Ulok four page Bulletin A1 illustrates and describes Union Carbide's new *Dynel* modacrylic fiber, dry-type, flat, air filters. Includes data and graphs of efficiency and pressure-drop tests, installation procedures for typical bank arrangements, details on construction and media, and list of stock sizes.

Union Carbide Development Co.

19—Glass Bab Filters

"Freedom from Hot, Corrosive Dust with Glass-Bag Filters" describes ways to lick tough air pollution problems. Bulletin 806 shows how the glass-bag filters in cement and metallurgical plants clean gases at temperatures up to 600°F. Two patented bag cleaning techniques also are discussed.

Dracco Div. of Fuller Co.

20—Exhaust Fans

Bulletin 1002 describes Norblo high and low speed exhaust fans. Used for dust collecting and air handling. Includes drawings of standard and special arrangements, dimension and capacity tables, friction chart, and test curves. Photographs show various arrangements and components. Drawings of installations.

Northern Blower Div., Buell Engrg. Co.

21—Air Filtering Equipment

Bulletin G-100-4 describes Farr's complete line of air filtering equipment for air conditioning, ventilating, and heating systems in commercial and industrial applications. Includes automatic filtering equipment, high efficiency disposable filters, panel filters, and grease filters. All equipment is illustrated.

Farr Co.

22—Fabric Dust Filters

Bulletin 150 describes the John Wood fabric filters for collecting industrial dust. Cutaway shows construction and operation. Gives engineering and design features. Method of installing filters is pictured together with filter fabric chart. Filter capacities of shaker-envelope, shaker-tube, and reverse flow-tube models.

John Wood Co.

23—Jet Cleaned Dust Collector

Bulletin F-106 describes the *Dualaire* jet cleaned dust collector with efficiency as high as 99.99%. Advantages are outlined. Schematic shows design of this dust collector and line drawings show components. Typical applications are listed in tabular form together with specifications. Installations pictured.

Western Precipitation Div. Joy Mfg. Co.

24—Activated Carbon Filters

Bulletin 107 describes and illustrates Dorex Types R and RF activated carbon air filter panels, low cost, high efficiency units designed to purify recirculated air. Ease of installation and simple refilling explained. Cutaway shows panels' function. Dimensional diagrams, capacities, methods of installation included.

Connor Engineering Corp.

AIR CONDITIONING & REFRIGERATION

25—Low Silhouette Condensing Units

Bulletin 7071-1 covers the "LSCU" low silhouette blower condenser with *Brunner-Metic* motor-compressor, Heat-X liquid receiver, electrical controls, and refrigeration accessories mounted in specially designed section. Construction features described and illustrated. Drawings show dimensions. Specifications.

Dunham-Bush, Inc.

26—Water Chilling System

Catalog EM 60-2235 describes the compact hermetic *Turbopak* used for various water chilling applications. Capacity 65 to 600 tons. Most compact hermetic centrifugal water chilling system. Cutaway shows operation and component parts. Operation is carefully explained. Diagram shows dimensions. Specifications.

York Corp.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

27—Air Conditioning Data File

A new high velocity data file is designed to help the air conditioning industry utilize the advantages of high velocity air transmission and distribution. It discusses what high velocity is, what it can do, and where it should be used, duct design, duct construction, and temperature control.

Barber-Colman Co.

28—Steam Humidifiers

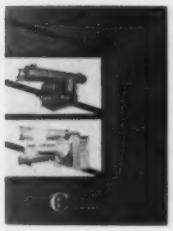
Bulletin 500-D discusses how relative humidity affects profits, affects hygroscopic materials, and lists other effects. Various applications are illustrated and results evaluated. Describes Armstrong's electrically operated humidifiers. Lists different types, gives prices and specifications. Includes selection data.

Armstrong Machine Works.

29—Remote Air Conditioners

Bulletin 35 describes Marlo *Seazonaire* remote room air conditioning units for multi-room installations, available in six standard types, floor or ceiling mounted, finished cabinet or recessed, capacities from 210 to 1260 cfm. Included are construction details, specifications, and installation dimensional drawings.

Marlo Coil Co.



30—Air Conditioning Products

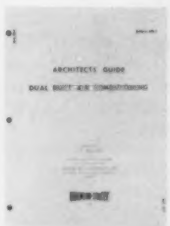
Catalog LL-349-10 covers the many products for industrial and commercial air conditioning made by Chrysler Corporation's Airtemp Division, Applied Machinery and Systems Department. Includes condensed data and ratings on packaged and liquid chillers, large central station packaged air conditioners.

Chrysler Corp., Airtemp Division.

31—Copper-Alloyed Galvanized Steel

Bulletin WC-255 describes the ultimate in galvanized sheets for air conditioning ducts and other applications, *SofTite Cop-R-Loy* galvanized sheets. Description of product, how and where it has been used, its manufacturing process, and other subjects are covered in detail with words and photographs.

Wheeling Corrugating Company.



32—Dual Duct Air Conditioning

Bulletin DD-7 discusses space requirements for risers, apparatus rooms and ceiling arrangements for Dual Duct Air Conditioning Systems. Includes basic apparatus arrangements, methods of design, and a discussion of the results to be obtained. Isometric examples of air distribution methods and other information.

Buensod-Stacey, Inc.

33—Central Plant Air Conditioners

Engineering catalog with illustrative and descriptive information and complete selection data on central plant conditioners, multizone conditioners, sprayed coil units, heating-ventilating units, cooling and heating coils. This catalog is notebook type and is index tabbed for easy and quick use.

Thermal Engineering Corp.

34—Tube-Ice Machines

Bulletin TI-4 describes Vogt's Automatic Tube-Ice machine. Occupies little space, requires less power, and operates automatically. Crushed or cylinder ice may be produced. Multi-color line drawing shows operation. Advantages, specifications, and detail drawings. Many photographs show various applications.

Henry Vogt Machine Co.

35—Bypass Weathermaster Units

The first high velocity induction units with built-in automatic air bypass control are described, illustrated and rated, in Carrier catalog number 36R-80. These new units for multi-room building air conditioning eliminate external pneumatic system and water control valves. Self-contained. Air, water flow constant.

Carrier Air Conditioning Co.

AIR CONDITIONING & REFRIGERATION *continued*

36—Air-Cooled Condensers

Catalog 7011A contains engineering and construction data for 4 remote air cooled condensers. "PFC" for well ventilated basement location; "LSBC" for outdoor ground or rooftop installation; "BC" and "BCW" for indoor or outdoor mounting. Catalog contains 26 sections including valuable reference tables.

Dunham-Bush, Inc.

37—Dual Duct Air Mixing Units

Bulletin DD-6 describes dual duct air mixing units for high and low velocity systems. Detailed information includes blue prints showing different arrangements for same space, cross-section diagrams, dimensions, performance data, and complete specifications. Installation and product photographs are shown.

Buensod-Stacey, Inc.

38—Packaged Water Chillers

Bulletin 91-534 describes Acme's *Flow Therm* packaged water chillers. Various applications listed and illustrated. Exclusive features given. Photograph shows construction and components are described. General specifications include dimensions, capacity ratings, condenser performance, and pressure drops.

Acme Industries, Inc.

39—Automatic Tube Ice Machine

Bulletin TI-3 describes Vogt's automatic tube-ice machine for streamlined sized ice production. Process and operation explanation is illustrated with multi-colored line drawings. Leading hotels that feature *Vogtice* machines for beverage cooling and food preservation are pictured. Other applications listed and

Henry Vogt Machine Co.

40—Remote Room Air Conditioners

Bulletin 250 describes *Bohn-Aire*, remote type room conditioners. Provide individual room control of temperature and humidity. Can be installed in existing buildings as well as new buildings. Units are pictured, cutaway shows construction and components. Includes types of controls, ratings, selection data, dimensions.

Bohn Aluminum & Brass Corp.

41—Air Distribution, Purification

Bulletin 31F describes representative models in the Kno Draft lines of air diffusers, grilles and registers, and high velocity equipment, and the Dorex line of air recovery and purification cells and canisters. Recent additions to the "Architects' Group" of rectilinear diffusers, type KO perforated, type KSS vari-pattern.

Connor Engineering Corp.

42—Central Air Conditioning Unit

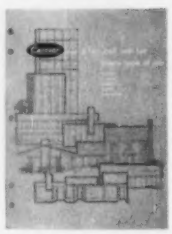
Bulletin AC-100 introduces a new line of *Kennard/Nelson* central station air conditioning units. Includes information on selection of complete packaged units with coils, accessories, filters, and even traps. Design and construction features described and illustrated. Charts, graphs, tables, and dimensional drawings.

American Air Filter Co., Inc.

43—Heating, Cooling Food Service

Bulletin 669 illustrates and describes Dean restaurant heating and refrigeration equipment. *Snopan, Colplate* and compartmented ice cream displayer for food displays and preservation. *Steempan* and *Panelcoil* for warming steam tables, bainmaries, plate cabinets, kettles, heaters, and other applications.

Dean Products, Inc.



44—Fan-Coil Units

The flexibility of the fan sections in this wide range (3 tons to 44 tons) of fan coil units makes them adaptable to a wide variety of versatile applications. Bulletin 38-216 describes and illustrates the magnitude of the Carrier fan coil line from residential to industrial models with ratings and data.

Carrier Air Conditioning Co.

45—Packaged Liquid Chillers

Bulletin L150.18-S describes the New York direct expansion type packaged liquid chillers. Capacities from 50 to 125 tons. Complete specifications on compressor, motor, liquid chiller, condenser, and controls. Complete physical data also included. Photographs show this factory performance-tested chiller.

York Corp.

46—Curtain Wall Air Conditioners

Bulletin PW-319 describes a new concept of curtain wall function, room-by-room air conditioning, an integral part of the Lupton curtain wall system. This is a true perimeter type system affording individual room control. It is a space saver and is easily installed. Includes capacities, dimensions, and specifications.

Michael Flynn Manufacturing Co.

47—Packaged Liquid Chillers

Catalog ME-123 covers "W" Series Packaged Liquid Chillers — 15 to 125 hp — with photographs, cutaway drawing, ratings, capacities, condenser capacity, physical data, and dimensional drawings on Chrysler Airtemp Applied Machinery and Systems Department's liquid chillers, commercial and industrial.

Chrysler Corp., Airtemp Division.

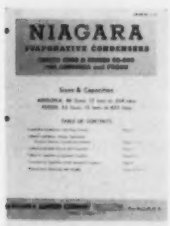
AIR CONDITIONING & REFRIGERATION *continued*

48—Multi-Purpose Air Conditioners

Catalog 601 presents Nesbitt air conditioner for gymnasiums, showrooms, laboratories, and similar spaces. Offered in 9 basic sizes ranging from 2 to 130 tons cooling and 36,600 to 1,690,000 Btu heating capacity. Exclusive Nesbitt return air bypass control available. Complete details, dimensions, and capacities.
John J. Nesbitt, Inc.

49—Airfoil Bladed Fans

Bulletin A-1103 describes centrifugal type, airfoil bladed fans manufactured by American-Standard. Available for general ventilation and industrial process applications. For conventional low velocity or high velocity conduit and double duct air conditioning systems. Illustrations include models and components.
American-Standard Industrial Division.



50—Evaporative Condensers

Catalog C-2 lists evaporative condensers in 46 sizes with table for easy selection of unit correctly sized to fit any job from 12 tons to 354 tons (Ammonia) or 425 tons (Freon). Description and pictures cover condenser types, construction, features, foundation arrangements, specifications, and dimensions.
Niagara Blower Co.

51—Heavy Duty Product Cooler

Bulletin 210 describes the Bohn PC Unit designed for large capacity cooling requirements where room temperatures of 34 and above are to be maintained. Adaptable to either free air delivery or for use with duct work. Contains unit features, selection data, and physical data. Photographs and line drawings.
Bohn Aluminum & Brass Corp.

52—Packaged Air Conditioners

Catalog 570A describes Acme packaged air conditioners, Model PAC, a complete air conditioning system in one package. Low cost installation and easy maintenance. Flexibility shown in line drawings. Construction details and description of components given. Complete dimensions, physical data, and accessories.
Acme Industries, Inc.

53—Compact Packaged Chillers

Catalog 8022A describes the new line of *Heat-X* "PC" package chillers for air conditioning systems, drinking water or beverage cooling applications, and industrial water cooling uses. Detailed specifications, capacity curves, dimension data for eleven models, 2-30 tons. Suggested specifications guide.
Heat-X, A Subsidiary of Dunham-Bush.

COMMUNICATION & SIGNAL EQUIPMENT

54—Audio Products Select-a-Guide

Radio Corporation of America offers in one package Select-a-Guides on Modular Sound Systems, Microphones, Amplifier Systems, and Loudspeakers. These fold-out easy-to-use folders illustrate, describe, and give specification data on the products. This is the first time this convenient package has been offered.
Radio Corporation of America.

55—Multiple TV Systems

Bulletin M-50-49 describes the Blonder-Tongue *Masterline* equipment for multi-set operation in master and community TV systems. Consists of the main folder, an article on installing master TV systems in motels, catalog sheet of specifications, and price list. Bulletin is illustrated, includes amplifier specifications.
Blonder-Tongue Laboratories, Inc.

56—Motel-Hotel Music Systems

Bulletin 51-L60 illustrates music and program distribution equipment for hotels and motels. A system with 5 channels of AM, FM or Hi Fi programs is described. Paging or alarm is included. Guest room selector panels for wall or table mounting may include *"Message at desk"* light and jack for intercom.
Rauland-Borg Corp.

57—Modern Signal Systems

A pocket size resume of all Edwards products for industrial and commercial applications. It fully describes the advantages and convenience of modern signaling, covering the full range from large control, communications and protection systems to single components. Various products pictured.
Edwards Co., Inc.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

58—Telephone Systems

Brochure 8002 describes DuKane private automatic telephone systems for any type of building requiring 2 to 200 or more telephones. Block specifications shown on 7 of 9 systems with each model illustrated. Special chart describes savings in increased efficiency. Additional information on request.

DuKane Corp.

59—Stereo and Hi-Fi Music Systems

Altec's new catalog AL 1302-1 features illustrations of custom stereophonic and monophonic installations. A special feature is the selection which diagrams the proper placement of speakers and other components in a room. All components are described in detailed technical information and specifications.

Altec Lansing Corp.

60—Automatic Time Controls

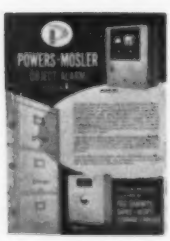
Bulletin 72 gives full week's schdeule of automatic ON/OFF control with individual daily programs for heating, lighting, ventilating, air conditioning, and others. Contains information on selection of proper switch action for various applications. Dimensions for enclosures and mechanism given.

Tork Time Controls, Inc.

61—Doctor's In-Out Systems

In Section HE-F two new doctor's In-Out Systems are described featuring miniaturized registers. *Message-Flash* alerts doctors as they enter or leave. Registers are inexpensive, easily maintained, expandable, and simply installed. Dimensions, wiring diagrams, and typical specifications are included.

Auth Electric Co., Inc.



62—Security Alarm Systems

Four Circulars describe types of proprietary security alarm systems for all classifications of buildings and property. Protection against vandalism, forced entry, and unauthorized presence is now available. Each circular explains a security system and its application; *Radi-Matic* Barrier, Alarm and Sentry Unit.

Powers Regulator Co.

63—Hospital Signaling Equipment

Bulletin 137 includes wiring diagrams, specifications, and equipment data on visual paging, doctors register systems; and visual, psychopathic, manual and automatic audio-visual nurses call systems. The bulletin details one of the most complete lines of hospital signaling equipment. Components illustrated.

S. H. Couch Co., Inc.

64—Electronic Trainer

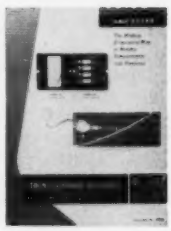
Brochure 3R3976 describes functions and method of Electronic Trainer, a building block workshop for effcetive teaching of electronic theory and practice. Learn-by-doing teaching device includes equipment for demonstrating fundamental and advanced electronic circuitry. Completely illustrated.

Radio Corporation of America.

65—Clock and Program Systems

Bulletin CL-572 describes the centrally controlled clock and program systems for schools, institutions, public buildings, and industry. Included is description of various systems illustrated with wiring diagrams. Features and applications of various types of clocks and audible signals are discussed. Specifications given.

Edwards Co., Inc.



66—Indicating and Alarm System

Bulletin 3036C describes in detail the Edison *Omniguard* indicating and alarm system. A reliable, low-cost temperature detection for small or large installations. Features, operation, specifications, connections, wiring diagram, and installation procedures are given. Various types are pictured and described.

Thomas A. Edison Industries.

67—Master TV System Manual

Master TV manual written especially for engineers designing master antenna signal distribution. Shows components used in master TV systems, engineers' specifications, glossary of terms, charts, and tables. Section contains information on how to calculate electronic signal gains and losses. Wiring diagrams included.

Blonder-Tongue Laboratories, Inc.

68—Private Telephone Systems

Product catalog, Section IX, describes Stromberg-Carlson's Dial-X private internal telephone communications systems. Every component is fully illustrated and described to show how it can be applied in 10-line, 20-line, and 40-line systems. Applications, specifications.

Stromberg-Carlson, Commercial Products Division of General Dynamics Corp.

69—Central Sound Systems

Bulletin 1-8601 describes a wide range of sound consoles for school and institutional use. Includes economical package systems and large consoles custom assembled from stock panels. Designed for flexibility and expansion. Specifications available on any model. Consoles and components illustrated.

Rauland-Borg Corp.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

70—Supervisory Annunciators

Section S covers industrial annunciators designed to give instant visible and audible alarm in any abnormal situation. Used to prevent costly breakdowns in machinery or vital services, the annunciators detect trouble before serious damage results. Full descriptions and dimensions of both drop and lamp type.
Auth Electric Co., Inc.

71—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, *Autoset* impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.
Stromberg Div. of General Time.

72—School Communication Systems

Bulletin 248 describes *Practi-Call*, the practical, all purpose communication system for schools manufactured by Standard Electric Time. What it is and how it works explained. Savings on equipment, installation, and maintenance outlined. Typical school layout diagramed. Components of *Practi-Call* pictured.
Standard Electric Time Co.

73—Public Address Systems

New catalog SWC 17e/AL dsecribes and shows examples of Altec's sound system building block flexibility. Each specialized component illustrated in the catalog is designed to work in complete harmony with every other item in the Altec line: microphones, amplifiers, preamplifiers, loudspeakers, and horns.
Altec Lansing Corp.

74—Supermarket Communications

Brochure 8020 describes DuKane communications equipment for supermarkets of any size. Complete floor plan of typical supermarket used to illustrate where various systems would be used to greatest advantage. Six different communications facilities explained. Various components illustrated.
DuKane Corp.

75—Time Recording Systems

"First quality for Timing Accuracy" contains general description of electronic, synchronous wired, and *Autoset* impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.
Stromberg, Div. of General Time.

ELECTRICAL APPARATUS

76—Aluminum Plug-In Busway

Bulletin GEA-6173 describes DE Aluminum Plug-in *Flex-A Power* Busway rated 225 to 1000 amperes. DE Busway is available in three-wire, three-phase and four-wire, three-phase designs for maximum 600 volt applications. Bulletin includes weights, dimensions, ratings, applications, layout, and specifications.
General Electric Co.

77—Interrupter Switches

Bulletin 1630A, 12 pages, describes and illustrates, arc chute type interrupter switches, fused and unfused, for switching feeder circuits. Usually metal enclosed, switch can be wall mounted or free standing, dimensions shown for both. Switches can close in on moderate faults.
I-T-E Circuit Breaker Co.

78—Multi-Metering Devices

Bulletin SL-27 describes Square D meter-breaker units and enclosures, fusible and non-fusible disconnect switches, service entrance terminal boxes and accessories. Bulletin also describes how EZ Stack design simplifies multiple metering installations and shows suggested arrangements for 5 to 16 meters.
Square D. Co.

79—Transformers and Substations

Bulletin 960 describes engineering and installation advantages of Sorgel dry-type load center transformers and substations. Includes 15-point checklist in specifying transformer and substation gear. Equipment up to 10,000 KVA and for all voltages up to 15,000. Photographs, cutaways, performance curves.
Sorgel Electric Co.

ELECTRICAL APPARATUS *continued*

80—Steel Floor Wiring System

Bulletin C-17099 contains complete information on the General Electric *Cellular* steel floor wiring system. Complete description, photographs, and dimensional drawings of all components are included. Contains layout design information, suggested specifications, application data, and installation instructions.

General Electric Co.

81—Power Converter

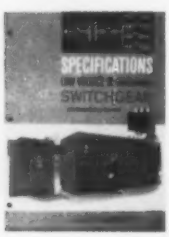
Bulletins 123, 201, 305, and 178 describe a static converter producing symmetrical 3-phase 220 or 440 current from a 220 single phase source. Describes uses for all industries. Balances out for any work load with no loss of work power. Various applications are illustrated.

Add-A-Phase Division,
System Analyzer Corp.

82—Specification Manual

New Manual SD-200 gives comprehensive specification data on Square D electrical equipment — safety switches, motor starters, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also contains convenient reference guide to National Electrical Code.

Square D Co.



83—Low Voltage Switchgear

Specification 18S6462C containing descriptive engineering data on metal enclosed switchgear. Thirty-two pages illustrated including side views and floor plans. Stored energy and conventional breakers explained with drawings. Dimensional data on cubicles and breakers; rating data for substation planning.

Allis-Chalmers.

84—Basic Electrical Protection

Booklet PBP, just released by the makers of Buss fuses, explains such terms as interrupting capacity, speed of response, and current limitation. Valuable information on motor protection, system selectivity to faults, fuse application, and fuse selection is given. Charts show time of opening and current limitation.

Bussmann Mfg. Div., McGraw-Edison Co.

85—Distribution Equipment

Catalog M-160 gives detailed information on BullDog Electric's line of electrical distribution equipment. Describes safety switches, load centers, lighting and power panelboards, switchgear assemblies, various types of electrical duct. Electrostrip multi-outlet and others.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

86—Low Voltage Switchgear

Advanced features of I-T-E's new K-Line circuit breakers and a complete review of new low-voltage power breakers and switchboards are presented in a two-color, 20-page bulletin 3200-1A. Description, selection, application, and specifications fully detailed. Equipment illustrated.

I-T-E Circuit Breaker Co.

87—Totally Enclosed Motors

Bulletin MU-224 describes totally enclosed polyphase motors 1 through 100 hp available from Wagner Electric Corporation. Motor features include heavy duty ribbed cast iron frames and endplates; improved bearing seals and provisions for relubrication. Dimensions and typical performance data included.

Wagner Electric Corp.

88—Industrial Capacitors

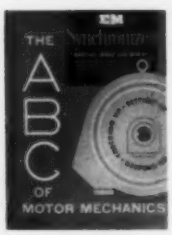
Booklet B-7642 contains 12 pages of easy-to-digest descriptive information on Westinghouse Capacitors, power factor correction and selection and application. This booklet can be of value in explaining the uses for capacitors to a client as well as an aid to selection and specification work.

Westinghouse Electric Corp.

89—Selecting Power Fuses

Data Bulletin 265 gives step-by-step method of selecting high-voltage power fuses for switching centers, substations, and service entrances. Method covers interrupting ratings, ampere rate selection, coordination, preloading adjustments, ambient adjustments, cooling time, and overload.

S&C Electric Co.



90—Manual of Electric Motors

A comprehensive technical treatise covering the design, testing, installation, and start-up of modern electric motors. There are sections on vibration, noise, ventilation, and maintenance. The 36 page book is profusely illustrated with up-to-date charts on methods and practical trouble shooting techniques.

Electric Machinery Mfg. Co.

91—DC Contactors and Relays

Catalog GEA-6621A describes all types of G-E contactors and relays for dc industrial control. Various types of controls are pictured using contactors and relays. Includes charted specifications, contact ratings, application data, wiring symbols, and panel layouts with dimensions on all types of controls.

General Electric Co.

ELECTRICAL APPARATUS *continued*

92—Wiring Devices

Four-page catalog 3025 lists Federal specifications with which Pass & Seymour wiring devices comply. Listed according to type, style number, and catalog number are Federal Specifications W-L-142, W-C-596, W-S-890, W-S-893a, W-S-896a. Includes company's complete line of wiring devices.

Pass and Seymour, Inc.

93—Wiring Devices for Industry

Bulletin describes and illustrates many Arrow-Hart wiring devices used in industrial applications and includes supplementary information of interest. An up-to-date review of grounding requirements illustrates latest advances in this area and new types of grounding devices are discussed.

Arrow-Hart & Hegeman Electric Co.

94—Molded Case Circuit Breakers

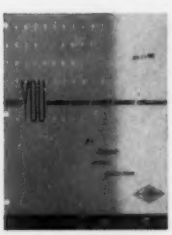
Bulletin 5040-B reviews fundamentals of short-circuit protection for motor circuits. Includes features and applications of ETI molded case breakers, tabulation of instantaneous trip range of ETI frame sizes, and suggested trip setting positions for various horsepower motors. Completely illustrated.

I-T-E Circuit Breaker Co.

95—Bus Duct

A series of bulletins covering technical descriptions, ratings, dimension, test data, protective devices, and hangers. Bulletins 30-660-1-2-3-4 cover bus duct, plug-in bus duct, low impedance bus duct, high impedance bus duct, and electric utility bus duct. Illustrated with construction drawings and diagrams.

Westinghouse Electric Corp.



96—Circuit Breakers

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manula 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needles circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

97—Oil Field Pumping Motors

Bulletin SB-176 illustrates and describes *Powrthon* electric motors specially designed for oil field pumping. Provides a check list for motor selection. Cutaway model shows construction. Bulletin features an easy method for selecting the right motor for any oil field operation. Frame sizes and performance curves.

Marathon Electric Mfg. Corp.

98—Underfloor Wiring Systems

Bulletin C-7089 describes General Electric's three steel underfloor wiring systems. Complete product information, layout design data, and suggested specifications can be found on G-E's single-duct, and two-level duct system. Photographs, and application data make this bulletin valuable to engineers.

General Electric Co.

99—Power Control Centers

Catalog SM-244, 16 pages, describes in detail the modern method for centralizing electrical power distribution and motor control equipment for industrial applications. It also contains suggested ideas for control specifications, and gives a simplified selector for use in control center layout and planning.

Square D Co.

100—Wound Rotor Motor Controls

Bulletin describes starting and speed regulator equipment for low voltage wound rotor motors, up to 600 volts. Contains details of outstanding features, complete specifications, ratings, dimensions, prices, and information required when ordering. Various types of controls and cabinets illustrated.

Allen-Bradley Co.

101—Aluminum Conduit Fittings

Catalog 59 lists, in condensed form, all types of aluminum conduit fittings made by Killark Electric Mfg. Co. Contains dimensional data of such items as circuit breakers, conduit bodies, connectors, explosion-proof vapor-tight and dust-tight fittings and fixtures. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

102—Laytex-Resin Control Cables

Booklet describes *Laytex*-Resin insulated control cables, its advantages over both braided conductor constructions and plastic types. Book contains detailed information on patented *Laytex* insulation and its unique properties. Detailed requirements are given in special specification section. Charts, graphs, and drawings.

Kaiser Aluminum & Chemical Sales, Inc.

103—Switchgear Selector Guide

Bulletin F-1700H, 12 pages, explains in 1-2-3 steps, the I-T-E system for proper selection of fused interrupter switchgear. Component arrangements and complete specifications provide basis for correct switchgear application with single assembly rating. Entrance arrangements diagramed.

I-T-E Circuit Breaker Co.

ELECTRICAL APPARATUS *continued*

104—Static Voltage Regulator

Bulletin GEA-7068 describes the new transistorized static voltage regulator made by General Electric. New low-maintenance design eliminates contacts and moving parts and gives accurate regulation. Includes dimensional and wiring diagrams. Shows electrical components card-mounted for accessibility.
General Electric Co.

105—Industrial Standby Plants

Four-page folder 4C-ON provides information on the selection of Onan standby electric plants and controls for industrial uses. Dramatizes need for emergency power in industrial applications. Lists choices of units, fuels, and starting methods. Includes data on L.T. Controls and Onan's inverter power unit, *Instapac*.
ONAN Div. of Studebaker-Packard Corp.

106—Frame Circuit Breakers

Square D Type AIB E Frame circuit breakers are described in bulletin SD-121. Single, two, and three pole breakers are available in 15 through 100 ampere trip ratings for both ac and dc systems. Bulletin also describes panelboards rated up to 600 amperes and approved for copper or aluminum cable.
Square D Co.

107—Remote Control Motor Operators

Bulletin 5047-1A deals with I-T-E's exclusive *Telemand* motor operator for remote control of molded case circuit breakers. The device is a foolproof, compact and economical unit for opening, closing or resetting molded case circuit breakers by remote control. Will fit any I-T-E breaker in J-frame size or larger.
I-T-E Circuit Breaker Co.

108—Lightweight Metallic Cable

Bulletin 1038 describes Simplex C-L-X, the lightweight, corrugated, impervious metallic cable sheath available in three new metals. Previously made of steel, C-L-X cable systems may now be ordered with copper, aluminum, or bronze flexible coverings. Advantages of the new metals are enumerated.
Simplex Wire & Cable Co.

109—Electrical Wiring Devices

Catalog, 1961, describes and illustrates complete line of over 1500 wiring devices and specialties, including new *Touch-A-Matc* quiet switches; new 20 amp devices; U-ground devices; switches, receptacles, and wall plates; power outlets lampholders; weatherproof devices. Federal specifications.
Eagle Electric Mfg. Co., Inc.

110—Controlway Systems

Bulletin describes Cope *Controlway*, a low cost method of supporting low voltage control cables, signal cables, and instrument tubing. Advantages of *Controlway* are listed. *Controlway* is illustrated as are other Cope cable supporting systems. Complete line of system fittings meet exacting requirements.
T. J. Cope Div. of Rome Cable Corp..

111—Hi-Lo Dimswitches

Bulletin describes the Slater *Hi-Lo* dimswitches. This switch will replace any existing switch for incandescent lamps. Fits any standard switch box. No rewiring necessary. In low position gives 30% of light. Increases life of bulb; saves electricity. Types of plates available are shown. Wiring diagrams.
Slater Electric & Mfg. Co., Inc.

112—Portable Diesel Generators

Bulletin describes AGSCO portable power. A 1100 KW portable diesel generating unit which is completely portable, easily transported, quickly installed, 60 or 50 cycle operation. Includes description of equipment and schematic drawing giving weights and dimensions. Complete unit illustrated.
A. G. Schoonmaker Co., Inc.

113—Motor Selection Guide

Bulletin 1024 was designed to assist consulting engineers in the selection of suitable motors from ½ to 10,000 hp for specific installation on original equipment, in commercial buildings and industrial installations. AC induction motors are outlined. A number of mechanical variations are shown.
Fairbanks, Morse & Co.

114—Electrical Fittings

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data.
O. Z. Electrical Mfg. Co.

115—Fused Switch Protection Report

Report on a series of tests conducted at a General Electric Laboratory. Fused safety switches and heavy duty interrupters were subjected to 200,000 amp short circuits, and performed without fault. Report describes method of testing, test conditions, and findings.
General Electric Co.
Circuit Protective Devices Dept.

ELECTRICAL APPARATUS *continued*

116—Low Voltage Circuit Breakers

Bulletin 4261-2B describes I-T-E's new *U-Re-Lites*, individually enclosed low voltage power circuit breakers. Information includes design, safety features, enclosure dimensions, selection chart, application data, and coil ratings. All features are illustrated photographically, as well as installation procedures.

I-T-E Circuit Breaker Co.

117—Stationary Batteries

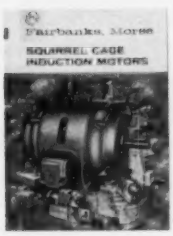
Bulletin 6444 describes *Exide-Ironclad* battery with tubulary-type positive plate, new design in stationary field. Saves up to 50% in space and weight over conventional types, lasts 20 years in float service. For telephone, microwave, fire alarm, electric utility, railway signaling, emergency light and power service.

Exide Industrial Division.

118—Bus Duct

Bulletin XL-765 provides technical data, dimensions, catalog information, and layout procedures for BullDog's new plug-in bus duct which exhibits low voltage drop characteristics and has built-in safety features. Also contains dimensions and technical data on X100 bus duct.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.



119—Squirrel Cage Induction Motors

Publication AEB450.6 describes the rerated line of F-M dripproof guarded motors in NEMA frames 182 through 445U. Motors are available in all mechanical and electrical types, either multispeed, high torque or intermittent duty. Cutaway shows construction and components are pictured.

Fairbanks, Morse & Co., Electrical Div.

120—Low Voltage Equipment Bus Log

Comprehensive buyers guide for service entrance equipment, circuit breakers and enclosures, safety switches, panelboards, busways, switchboards, motor control centers, sectional distribution centers, trolley busway, current limiting fuses. Photographs, application data, and prices.

General Electric Co.
Circuit Protective Devices Dept.

121—Gentherm Magnetic Wire

Folder M-6.1-60 contains a sample and general information and performance characteristics of Super *Gentherm*, General Cable's new polyester Class F-155°C enamel magnet wire. Comparative data of *Formvar*, *Gentherm* and Super *Gentherm* enameled wires. Meets military specification. MIL-W-583B.

General Cable Corp.

122—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development whichprovides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

123—Protective Fuses

Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.

124—Cicuit Breaker Load Centers

New Square D Bulletin SD-100 describes complete line of Type QO circuit breakers plus full information on QO devices including service entrance and special purpose equipment. Bulletin describes new rejection feature to meet NEC requirements and includes convenient load and circuit chart to simplify planning.

Square D Co.

125—Underfloor Duct System

Catalog 203 describes the Orangeburg underfloor duct system, non-metallic underfloor raceways for distribution of electrical wiring in commercial, industrial, and institutional buildings. Drawing keyed to index shows components, which are also pictured and described. Instructions for installation given.

Orangeburg Manufacturing Co., Inc.

126—Cable Support Systems

Catalog 103 describes Chalfant cable support systems. Chalfant cable trays, racks, and troughs are designed as the most economical and efficient method of support electrical armored cable, low voltage control cables, and process tubing. Made of aluminum, galvanized steel, or aluminized steel.

Chalfant Products Co.

127—Automatic Transfer Switches

Bulletin IR-0033 on Zenith transfer switches in emergency power systems. Describes switches mechanically held in normal and emergency positions, mechanically held in one position and electrically held in other, magnetically or electrically held in both. Also details and diagrams on designing systems.

Zenith Electric Co.

ELECTRICAL APPARATUS *continued*

128—High Voltage Power Cables

Bulletin RCP-7001 describes *Rozone* and *Rozone A* insulated high voltage power cables. Bulletin contains advantages, specifications, ratings, scope, conductors, and shielding. *Rozone* and *Rozone A* insulations are described. Tables show proper insulation and jacket thicknesses for various applications. Illustrated.

Rome Cable Division of Alcoa.

129—Pressure Contact Switches

Bulletin 101 describes Barkelew's *Bolt-Log* load break service entrance switches. Furnished in 1200, 1600, and 2000 amp capacities for 240, 480, and 600 volt 60 cycle ac service. Two, three, and four pole, fused or unfused, front or rear connection. Mountings, construction, dimensions, and tests included.

Barkelew Electric Mfg. Co.

130—Load Break Switches

Complete line of Pringle load break switches are described in loose-leaf catalog. Detailed photographs show switches in open and closed positions. Section gives complete engineering data. Test data on temperature and performance. Gives complete information on industrial grounding. Wiring diagrams.

Pringle Electric Manufacturing Co.

131—Power Circuit Transformers

Bulletin P571-15 describes Jefferson's power circuit transformers, the economical, efficient approach to better power distribution. Line drawings combined with tables give all dimensional data. Application data includes selection, mounting, and conversion. Also given are wiring diagrams and specifications.

Jefferson Electric Co.

132—Aluminum Electrical Fittings

Bulletin AL-60 describes Appleton's aluminum fitting which weigh about 33% less than similar fittings of other metal content. Includes broad line of aluminum copper-free fitings including *Unilets*, junction boxes, switch covers, receptacles, accessories, and lighting fixtures. Illustrations and specifications.

Appleton Electric Co.

133—Insulated Wire and Cable

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer.

Kerite Co.

134—Packaged Transformer Units

Bulletin 5601-1A shows transformer, primary and secondary devices in compact package for easy installation at load area. Ventilated dry type, three phase, up to 500 kva and 5 kv. It's for indoors, is 38″ deep x 75″ long x 70″ high. Shows interior arrangement, size and selection charts, lists optional features.

I-T-E Circuit Breaker Co.

135—Emergency Power Guide

Booklet 40-20205-DN927 is Caterpillar's guide book for emergency power. Describes in detail the three sources of standby power – central battery systems, two circuit systems, and emergency generator sets. Details many advantages of diesel generator sets. Selection data of proper diesel for specific application.

Caterpillar Tractor Co., Engine Division.

136—Medium Transformers

Bulletin GEA-6108C gives descriptions, characteristics, performance data, weights and dimensions, standard and optional accessories of medium transformers. The graphically illustrated bulletin features transformers in ratings 501-10,000 kva, oil or *Pyranol*® filled, single or three phase and load tap changing.

General Electric Co.

137—Voltage Distribution Systems

Bulletin 249 describes *Power-Flex*, the voltage system for high school laboratories. This system is flexible, complete, safe, compact, rugged, and Underwriters' Laboratories approved. Schematic of typical *Power-Flex* installation. Control center pictured and described. Service outlets and extension cords listed.

Standard Electric Time Co.

138—PVC Rigid Conduit

Bulletin KE 1058 is a new 20-page rigid polyvinyl chloride electrical conduit catalog. Included are comprehensive test results, specification information, installation instruction, corrosion resistant charts, and other valuable data. Illustrations show various types of pipe and fittings. Pictures show proper assembly.

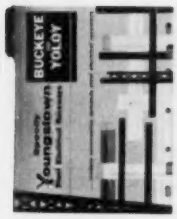
Kraloy Plastic Pipe Co., Inc.

139—Power Transformers

Booklet 7391 E describes in detail the 400 kv power transformers built by ASEA Electric. Booklet is a complete technical study of these transformers including charts, graphs, oscillograms, wiring diagrams, and line drawings. Completely illustrated with photographs including dramatic over-excitment tests.

ASEA Electric, Inc.

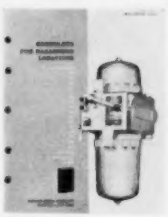
ELECTRICAL APPARATUS *continued*



140—Steel Electrical Raceways

Bulletin SPA-034-260 describes Buckeye and Yoloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical properties are given. Photographs show installation while buildings are under construction. Conform with the requirements of Underwriters Laboratories.

Youngstown Sheet and Tube Co.



141—Conduiets, Hazardous Locations

Bulletin 2722 describes Crouse-Hinds' condulets for hazardous locations. Commercially used hazardous substances are listed with specifications in tabular form. Discusses wiring methods and shows installation diagram for sealing condulets. Also includes explosion-proof condulet diagrams for lighting and power.

Crouse-Hinds Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

142—Fuse-Fuseholder

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection.

Bussmann Mfg. Div., McGraw-Edison Co.

143—Reduced Current Motor Starting

Bulletin MU-251 describes increment motor and starter combinations that start squirrel-cage motors economically, efficiently and in keeping with power company regulations. Combinations are available to start motors in two or more steps without opening line. Voltage fluctuations kept to minimum.

Wagner Electric Corp.

144—Heavy Duty Synchronous Motors

Bulletin 252 describes a line of bracket bearing type synchronous motors, 60 hp and larger. The motor line is available in either 1800 or 1500 rpm, 60 or 50 cycles, in all standard voltages, and either single or 2 bearing. The motors are available in most NEMA enclosures. Cutaway shows construction.

Electric Machinery Mfg. Co.

145—Substation Transformers

New bulletin 5800-1A describes liquid-filled units – single and three phase, 501 to 10,000 kva, up to 69 kv. Includes information on tank, coils, cores, core and coil assembly, instruments, controls, standard and optional accessories, dimensions for single and three phase transformers, and specification guide.

I-T-E- Circuit Breaker Co.

146—Saturable Reactors

Bulletin 658 describes Sorgel's saturable reactors, to regulate and control electric power for various manufacturing processes. Reactors from 15 kva to 470 kva are pictured. Typical single phase reactor circuit shown. Enclosed is a sheet listing required information for quotation on saturable reactors.

Sorgel Electric Co.

147—Single Phase Motors

Bulletin 189 describes unique motor that operates on either single or three phase. Single phase ratings available up to 75 horsepower. Efficiency generally exceeds that of most motors. Advantages and operating comparison included in bulletin. General data and typical applications included.

System Analyzer Corp.

148—Load Break Switch

Instruction book 18X9442 contains descriptive data on high voltage stationary load break switches. Fourteen pages with side views, floor plans, rating and application data for substation planning. Pothead installation instructions included. Both indoor and outdoor applications are described and illustrated.

Allis-Chalmers.

149—Metalclad Switchgear

This 36-page brochure describes S&C metalclad switchgear. Application and performance, components, specifications, and accessories are described and illustrated. Photographs and diagrams show how metalclad switchgear is used in industrial distribution systems. Excerpts from 1959 National Electrical Code.

S&C Electric Co.

150—Liquid-Filled Transformers

Bulletin GEA-6832A describes distribution equipment transformers rated 112½ to 2500 kva, oil or *Pyranol*® filled, for conventional or unit substations. Outlines construction details, standard tests, accessories, and switches. Includes tables and diagrams giving electrical and mechanical characteristics.

General Electric Co.

ELECTRICAL APPARATUS *continued*

151—Power Panelboards

Bulletin VBP-470 contains information on features, design, and operation of BullDog Electric's fusible *Vacu-Break* power panelboards. Includes circuit and dimensional data, trim data, and suggested specification. Illustration shows panel and components. Illustrated.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

152—Ambient Compensated Relays

Engineering bulletin describes new A-H ambient compensated O.L. relays, the only devices now available that compensate automatically for both heat and cold. Operate on same time curve from –20°F to +165°F. Require no adjustment. Advantages, operation, and heater tables. Drawing shows construction. Photographs.

Arrow-Hart & Hegeman Electric Co.

153—Synchronous Motor Controls

Bulletin 6092 deals with starting and speed regulation of low voltage wound rotor motors, up to 600 volts. Cutaway shows construction and components. Advantages are outlined in detail. Includes photographs and wiring diagrams. The Allen-Bradley line of synchronous starters illustrated and described.

Allen-Bradley Co.

154—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption.

Heinemann Electric Co.

155—Electric Generating Equipment

Catalog 11F-ON describes and illustrates Onan electric generating plants, air-cooled engines, separate generators, and engine-compressors which are available for the Original Equipment Market. Catalog includes application photographs, ratings, specifications, and performance data on the equipment available.

ONAN Div. of Studebaker-Packard Corp.

156—Electrical Wiring Devices

Catalog 2-57 describes various wiring devices manufactured by the Slater Electric & Mfg. Co. Includes appliance switches, lampholders, power outlets, receptacles, switches, weatherproof devices, wall plates, and automatic *Kloz-A-Lite*. Loose leaf catalog consisting of numerous illustrated Slater bulletins.

Slater Electric & Mfg. Co., Inc.

157—Electrical Wiring Devices

Catalog 60, 75 illustrated pages, describes complete range of electrical wiring devices. Both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures to devices for every purpose are listed. A 15-page index and price list are also included in this catalog.

Pass & Seymour, Inc.

158—Explosion-Proof Fittings

Catalog of aluminum explosion-proof fittings for hazardous locations. Included are junction boxes, conduit bodies, sealing fixtures, plugs and receptacles, pilot lights, switches, and fixtures. Complete dimensional data makes ordering easy. Special fittings made to order. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

159—Pre-Assembled Aerial Cable

Bulletin KW-374 describes aluminum self-supporting pre-assembled aerial power cable. Covers detailed descriptions of various constructions as well as advantages of aluminum over copper aerial cables. Specification figures on Butyl insulation and neoprene jacket are included. Also contains messenger data.

Kaiser Aluminum & Chemical Sales, Inc.

160—Motors for Machine Tools

Bulletin No. SB-191 describes how to select motors for machine tool applications. Charts show torque characteristics and how to match to definite applications. Analyzes a typical duty cycle. It illustrates typical machine tool motors and applications. Illustrated with photographs and schematics.

Marathon Electric Mfg. Corp.

161—Magnetic Motor Starters

Bulletin SM-293 covers Square D line of magnetic starters. New 8-page bulletin gives construction features of magnetic starters from NEMA Size 0 through Size 5, demonstrates installation, inspection and maintenance routines. Also describes field modification kits and variety of enclosures available.

Square D Co.

162—Mobile Diesel Generators

Bulletin describes AGSCO 300 kw diesel-electric mobile generating unit. Suitable for any standard voltage, 3 phase, 60 cycle, for parallel operation. This power plant on wheels is pictured. A schematic drawing shows components and gives dimensions. Equipment specifications include accessories.

A. G. Schoonmaker Co., Inc.

Consulting Engineer Directory of Advertisers' Literature --- February 1961

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ELECTRICAL APPARATUS *continued*

163—Emergency Generating Sets

Bulletin 2900 describes the complete range of Fairbanks-Morse emergency generating sets. Includes gasoline, LP and other dry gas fuel units of 400 watts to 150 kw, and diesel units 3 to 2500 kw. Complete data selection tables outline various cycle, phase, and volt characteristics. Manual, remote control.
Fairbanks, Morse & Co.

164—Cable Support Systems

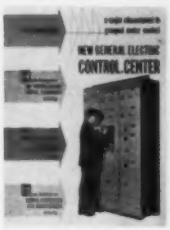
Catalog 1257 describes Cope cable supporting systems — cable trough, cable ladder, channel support systems, and accessories. Each type of cable support is explained and illustrated. Product identification line drawing keyed to index makes this loose-leaf catalog easy to use. Parts are illustrated. Available sizes.
T. J. Cope Div. of Rome Cable Corp.

165—High Frequency Bus Duct

Bulletin B-7326 describes Westinghouse's revolutionary new method of transmitting high frequency power. Frequency range from 180 to 20,000 cycles with voltage drop of less than 1 volt per 100 feet. Installation procedures, typical applications, features and components are shown. Closeup shows construction.
Westinghouse Electric Corp.

166—Terminating, Splicing Fittings

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials.
O. Z. Electrical Mfg. Co.



167—Motor Control Center

Bulletin GED-4152 covers new, advanced-design, 7700-Line Motor Control Center. Bulletin points out new design features for equipment protection and personnel safety, ease of maintenance and ease of installation. Takes motor starters to NEMA Size 6, feeder circuits to 800 and power loads to 1200 amperes.
General Electric Co.

168—*Touch-A-Matic* Quiet Switches

The only switch with both screw and E-Z wire pressure terminals. Brochure describes *Feathertouch* rocker action, endurance tests. Rated 15 amps and 20 amps, 120-277 volts ac, *Touch-A-Matics* come in single pole, 3-way, 4-way, flush, and interchange. Takes standard wall plates. Installs in any position.
Eagle Electric Mfg., Inc.

169—Cables for Power Circuits

Bulletin 1037 describes Simplex *Anhydroprene XX* cables for power circuits up to 600 volts, designed for service in ducts or conduits or as open wiring in buildings. The jacket is a balanced compound of neoprene and other ingredients which provides balanced resistance to sunlight, oil, acids, heat, flame, abrasion.
Simplex Wire & Cable Co.

170—Current-Limiting Breakers

New bulletin 4300-1A describes I-T-E's K-Don line of LV current-limiting circuit breakers and switchgear. Bulletin gives complete description, complete selection and application information, dimensions, and guide specifications. Two colors with full photo illustration. Sales offices listed.
I-T-E Circuit Breaker Co.

ENGINEERS' OFFICE & FIELD EQUIPMENT

171—Portable Microfilmer

Bulletin A-948 describes the new Recordak portable microfilmer. Illustrated in full color, this six page folder explains and illustrates the outstanding features. This portable microfilmer weighs less than an office typewriter, 24 lbs, and measures 6½" x 15¾" x 12¾". Fits compactly into a handy carrying case.
Recordak Corp.

172—Solid-State Processing System

Booklet serves as a brief, compact introduction to the 7074 solid-state data processing system. Topics covered include modularity, speeds, and program compatibility with the 7070. Fast and economical. A list of programs available from the 7074/7070 programming library is also included.
International Business Machines Corp.

ENGINEERS' OFFICE & FIELD EQUIPMENT *continued*

173—Micro-Reproduction System

Bulletin MF-DODS is a brief discussion of the new standards and specifications of the Department of Defense engineering data micro-reproduction system. Uniform standards this system covers are listed. Aperture card formats are described and illustrated. Describes equipment standardization for uniformity.

Minnesota Mining & Manufacturing Co.

174—Data Processing System

Describes the outstanding performance characteristics and processing opportunities presented to the engineering and research professions by the new expanded 1620, with storage increased to 60,000 positions and high speed punched card input and output. Component units illustrated.

International Business Machines Corp.

175—Microfilming Systems

A presentation of modern microfilming in booklet form by Recordak, the originator of modern microfilming. Explains the system in precise form. Show sample films of the various steps in recording a specific engineering drawing. Finally reproductions of the film printed on opaque and translucent vellum stock.

Rocordak Corp.

176—Blue Print Racks

Bulletin describes *Glider* blue print racks manufactured by Momar Industries. Advantages of using this equipment outlined. Models are illustrated together with accessory shelf, file cabinet, and extension racks. Detail photographs show direct-clamp action of plan holders. Also enclosed is price list of equipment.

Momar Industries.

177—Drafting Room Equipment

Catalog GC-59 describes Stacor lifetime quality equipment for the drafting room. Includes flat drawer filing cabinets, roll files, all types of drafting tables, tracing boards and tables, other equipment. Cutaways and exploded views show construction and components. All equipment offered illustrated. Dimensions given.

Stacor Equipment Co.

178—Aluminum Raised Floor System

Bulletin PW-360 describes the *Lupton* aluminum raised floor system designed to support electronic data processing equipment. Brochure illustrates special features of system and its installation. Supplementary information contains complete specifications. Main office, plant, and sales offices listed.

Michael Flynn Mfg. Co.

179—Vest Pocket Corrosion Calculator

This vest pocket calculator shows wide variety of chemicals and *Glascote* 778 resistance to their corrosive effects. *Glascote* 778 is a glass lining for vessels, reactors, and storage tanks. The calculator gives the effect of these chemicals at room temperature, 312°F, and 350°F. A scale provides thermal shock limits.

Glascote Products, A. O. Smith Corp.

180—*Thermo-Fax* Copying Machine

Bulletin TF-SQB illustrates and describes 10 different uses and applications for *Thermo-Fax* copying machines, and lists 50 other uses for specific departments. Each use is illustrated. Also includes a brief description of copy paper colors available and the new laminating film. Illustrated in full color.

Minnesota Mining & Manufacturing Co.

FIRE PROTECTION EQUIPMENT

181—Slim Line Fire Alarm Station

Bulletin A-880 describes in Autocall's Type FA fire alarm station, new slim profile, smaller size, and easy operation. Line drawings compare profile of other makes to the slim line of Autocall's. Quick check list of Type FA features included. Photographs show face of station open and shut.

Autocall Co.

182—Fire Vents

Bulletin FY-R59 is a technical report on how fire vents reduce fire destruction to commercial and industrial property. The *Smokehatch, Smokeport,* and *Pyroport* vents are illustrated and described. Included are suggested specifications and line drawings showing operation. Fire hazard rating charts on all models.

Penn Ventilator Co., Inc.

FIRE PROTECTION EQUIPMENT *continued*

183—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles, permitting nozzle section to be rotated 360° without removing bolts. Furnished with or without breakable flange and stem coupling. All parts removable thru inside of barrel. Bell, mechanical joint or flange pipe connections.
R. D. Wood Co.

184—Fire Alarm Systems

Bulletin 131A explains, "What is a Couch local fire alarm system?" It tells how to select, from a complete line of systems, the modular fire alarm system for your institutional, commercial, or industrial building. Each of your system layouts include wiring diagrams, specifications, and a variety of optional features.
S. H. Couch Co., Inc.

HEAT EXCHANGERS & WATER HEATERS

185—Pyrex Modular Heat Exchangers

Bulletin PE-33, 28-page manual, gives basic facts on characteristics, design, and operation of *Pyrex* modular heat exchangers. Covers shell and tube units, cascade coolers, jacketed exchangers, bayonet exchangers, and calculation of size and circuitry. Text illustrated with line drawings and photographs.
Corning Glass Works.

188—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.
Condenser Service & Engrg. Co., Inc.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

189—Gas-Fired Water Heating Systems

A Guide to the proper sizing, selection, and installation of gas-fired water heating systems for all types of restaurants and cafeterias. Various types of dishwashing equipment are described. Basic information is furnished on water and gas piping, venting, and required clearances. Diagrams and cutaways.
American Gas Association.

186—Steam Converters

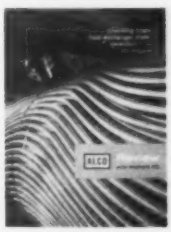
File No. 1460 describes a new line of Dunham-Bush "SC" steam converters for heating radiation water with steam and commonly applied for providing heating water for office space in industrial buildings. Catalog includes specifications, dimensional data, operating data, leaving water temperature tables, and diagrams.
Dunham-Bush, Inc.

190—Heat Transfer Equipment

Bulletin HE-8 describes the wide range of heat transfer equipment built by Vogt. Standard and custom built types from steel, alloys, or nonferrous materials for every temperature, pressure, or vacuum service. Conforms to all codes. Features of design shown for each type of heat exchanger. Fully illustrated.
Henry Vogt Machine Co.

187—Heat Transfer Equipment

Catalog 160 comprehensively covers heat exchangers, supercharger air coolers, industrial and oil field equipment and heating and air conditioning products. Information includes a brief history of the company, a description of its facilities and a complete product resume including installation photographs.
Young Radiator Co.



191—Checking Heat Exchanger Costs

Fall-Winter 1960-61 Alco Review features article on how to check costs when selecting material for heat exchangers. Exchanger material costs and characteristics such as weldability, maximum stress are given in text, six tables, three charts. Another article covers use of steel pipe in water filtration plant.
ALCO Products, Inc.

HEAT EXCHANGERS & WATER HEATERS *continued*

192—Water Heating Guide

Concerned with the problem of furnishing hot water for large buildings? Write for a copy of booklet TH-160 on indirect type instantaneous water heaters, their application, selection, and installation. Indirect type water heaters obtain heat from the same hot water or steam boiler that furnishes heat for the building.
Bell & Gossett Co.

193—Panelcoil Heat Transfer

Bulletins M8 to M13 describe and illustrate how *Panelcoil*, in single and double embossed types, takes the place of pipe coils and tank jackets in industrial processing, handling, and storage equipment. Show details of applications for heating and cooling. Various styles of *Panelcoil* to fit your application are illustrated.
Dean Products, Inc.

HEATING & VENTILATING EQUIPMENT

194—Infra-Red Heating Album

Bulletin P-1-60 contains photos of over 20 *Panelbloc* installations showing the vast range of applications which can be covered by infra-red heating. Included are automobile agencies, gas service stations, retail stores, woodworking and machine shops, farms, and manufacturing plants. Description on each photo.
Bettcher Manufacturing Corp.

198—Centrifugal Fans

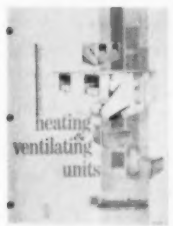
Catalog 1120-1 describes Westinghouse's all purpose centrifugal fans, Series 3000. Suitable for many applications such as supply and exhaust, general ventilation, industrial air conditioning, tunnel ventilation, and industrial processing. Text is completely illustrated with photographs, charts, and graphs.
Westinghouse Electric Corp.

195—Ready-To-Run Fan Sets

Catalog 517 describes a new line of V-belt driven *Ready Units*. Features of construction and available special features are outlined. Selector charts indicating volumes to 25,000 cfm and static pressures to 2½ in. are shown in charts and graphs. Dimensions, capacities, shipping weights, and motor limits included.
Clarage Fan Co.

199—Belt-Driven Tubeaxial Fans

Bulletin 625, eight pages, describes Type BT and BTV tubeaxial fans in 30 to 60 inch sizes. Designed for handling high temperatures, corrosive and explosive fumes, abrasive dusts, dirt laden air, high humidity. Also lists general fan laws, data on system and open surface tank ventilation, and duct resistance.
Robbins & Myers, Inc., Propellair Div.



196—Heating and Ventilating Units

Bulletin 9727 describes American-Standard heating and ventilating units, for both draw-thru and blow-thru applications. Offered in 11 sizes for 600 to 66,000 cfm. Cutaway shows construction. Complete information on coils, fans, and accessories. Details of construction, heating capacity and fan capacity charts.
American-Standard Industrial Division.

200—Cast Iron Boilers

Catalog H-254 describes Weil-McLain's commercial and industrial gas, oil and combination gas/oil boilers. Net gas ratings to 3354 mbh (129.1 hp), net oil ratings to 2942 mbh (113.2 hp); ratings approved by Institute of Boiler & Radiator Manufacturers. Contains description, ratings, dimensions, and drawings.
Weil-McLain Co.

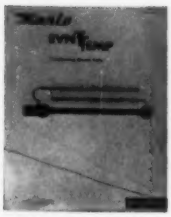
197—Designing with *Duct-D-fuses*

An engineering bulletin that describes the design procedure and performance characteristics of the *Duct-D-fuser*. Throw and capacity of the various nozzle sizes and arrangements. The *Duct-D-fuser* is installed as an integral part of the circular duct run. Velocity and perforation tables. Nozzle layouts.
United Sheet Metal Co., Inc.

201—Cabinet Unit Heaters

McQuay Type CH Cabinet Unit Heaters are designed for economical, dependable forced air space heating when steam or hot water is used as thermal medium. Bulletin 351 covers general design features, unit arrangements, capacity ratings, curves, performance data, specifications, and other information.
McQuay Inc.

HEATING & VENTILATING EQUIPMENT *continued*



202—Steam Coils

Bulletin M-10 contains information on new Marlo *Eventemp* distributing steam coils, for modern heating systems using modulating or two-position controls. Unique design provides even temperature throughout entire face area, even when partially throttled during light loads, with precise control.

Marlo Coil Co.

203—Direct-Fired Combustion Chamber

Package design *Todd-Thermo* high heat release combustion chamber for direct firing of oil, gas, or combination oil/gas, is described in bulletin TD58-43X. Standard unit or custom built with capacities from 150,000 to 200,000,000 Btu/hr, air-cooled. Needs no refractory, gives trouble-free performance.

Todd Shipyards Corp., Products Div.

204—Multi-Zone Platecoil

Bulletin 159, 48 pages, completely describes new *Multi-Zone Platecoil*, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Platecoil Division, Tranter Mfg. Inc.

205—Surface Unit Heaters

Catalog 956 describes *Grid* cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

206—Industrial Ventilators

Bulletin 6-GA describes unique new engineering principal of air powered industrial ventilators, air exhaust, recirculation, and supply systems which reduce heating costs up to 45%. Includes construction features, advantages, performance, dimensions, and installation data.

Genie-Air Products
Division of N.T.W. Corp.

207—Fibre Duct

Bulletin 300 describes Sonoco's fibre duct, *Sonoairduct*, for slab-on-ground perimeter heating and combination heating and cooling installations. Gives features and advantages and method of installation. Pictures show how duct is laid before pouring slab. Includes detail drawings for perimeter heating.

Sonoco Products Co.

208—Roof Ventilators

Bulletin BSO-60 is a working tool offering valuable engineering tables for selecting and sizing the proper intake or exhaust gravity ventilator. Technical report offers formulas to simplify specification of particular unit for ventilating a given area. Included are accessories and suggested specifications.

Penn Ventilator Co., Inc.

209—Gas-Fired Unit Heaters

Catalog 2760-1 illustrates and describes the Young gas-fired unit heaters, newly engineered to include as standard, quality features in demand in today's market. Information includes a description of construction features, available accessory equipment, the motor and lubrication system. Dimensions and ratings.

Young Radiator Co.

210—Quiet Operating Fans

The *Acousto Fan*, which features a *Flow-Nozzle* air foil wheel designed specifically for quiet operation, is described in Bulletin 592. Quiet zone selection tables make an automatic selection of the quietest possible fan. Capacities range from 6000 cfm to 220,000 cfm, static pressure 3 in. wg through 11 in. wg.

New York Blower Co.

211—Power Roof Exhausters

Bulletin 100-1959 describes Ammerman's PB and BCD *AirXpeler* power roof exhausters fabricated of aluminum or molded reinforced fibreglass. Offered in a large variety of sizes and speeds. Gravity or fresh air intakes available. Catalog illustrated with photographs and diagrams. Complete specfications.

Ammerman Co., Inc.

212—Air Diffusers

Bulletin K27-A illustrates and describes linear and rectangular series air diffusers. Offered in three series – square, panel, long-slotted – units combine best air distribution and modern styling. Dimensional drawings for several types in each series provided. Complete selection and performance data, list of agents.

Connor Engineering Corp.

213—Electric Cabinet Heaters

Bulletin E403 presents complete details on Nesbitt cabinet heaters for electric heating. Designed for maximum flexibility of arrangement and operation, these electric units are available for floor, ceiling, wall or inverted mounting; non-recessed, semi-recessed, fully recessed or concealed installations. Drawings, charts.

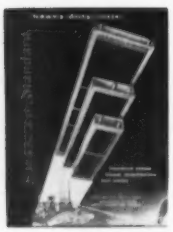
John J. Nesbitt, Inc.

HEATING & VENTILATING EQUIPMENT *continued*

214—Bifurcator Fans

Catalog DB-37-55, 16 pages, describes operation of the bifurcator fan, a split-housing fan that exhausts hot, corrosive, and flammable fumes. Use of the bulletin makes fan selection easy since it gives full data on fan laws and static pressure, velocity pressure, and friction.

DeBothezat Fans, Division of American Machine & Metals, Inc.



215—Heavy Duty Heating Coils

Bulletin B-1518 presents the first complete line of heavy duty heating coils designed and built to meet the rigors of industrial service. Advantages, materials, and construction outlined. Each type of coil is illustrated and specifications are shown in chart and diagram. Selection data in charts, graphs and diagrams.

American-Standard Industrial Division.

216—Steel Boilers

Catalog describes the complete line of Pacific Steel boilers. Exculsive features are outlined and illustrated. Each model is illustrated and ratings are given in tabular form. Accessories are shown together with other Pacific Steel products. Graph of heating capacity.

Pacific Steel Boiler Division of Crane Co.

217—Airfoil Centrifugal Fans

Catalog 1125 describes Centriline, Series 200, airfoil fan with in-line air flow. Includes advantages, sound and performance curves, and drawings showing space-saving features. Cutaway shows construction. Also contains application and selection data and standard specifying tables. Dimensions, arrangements.

Westinghouse Electric Corp.

218—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

219—Airfoil Blade Fans

Catalog 859 describes a new line of highly efficient, quiet airfoil blade fans. Dynafoil fans are particularly applicable to mechanical draft and heavy duty applications, such as industrial processes, conduit air conditioning, and tunnel ventilation. Various arrangements and panel openings pictured. Dimensions given.

Clarage Fan Co.

220—Air Moving Devices Test Code

Bulletin 210 explains the Standard Test Code for Moving Devices, issued by the Air Moving and Conditioning Association Inc. Covers scope, definitions, test set-up and equipment, observations, calculations, and results. Includes tables, charts, graphs, and schematics. The purpose and major association activities outlined.

Air Moving and Conditioning Ass'n Inc.

221—Paraflo Space Heaters

Bulletin 580-13 describes the line of Dravo space heaters designed for use in the 200,000 to 500,000 Btu/hr range. Drawings and specifications on the four heaters are given. The *Paraflo* heater is used as a low-cost method of heating medium-sized industrial plants and commercial and institutional buildings.

Dravo Corp.

222—Rigid Plastic Fabrications

Bulletin 9-2 describes rigid plastic fabrications that contain, convey, or exhaust corrosive materials or fumes. Corrosion-proof throughout, these fabrications fill a basic need in industry. Also included are several installation photographs, along with properties and resistance characteristics charts.

Atlas Mineral Products Co.

223—Heating and Ventilating Cabinets

Bulletin UH-130 gives complete description on heating and/or ventilating cabinets. Type HV is for both heating and ventilating in horizontal or vertical operation. Type V is for ventilating only. Information includes unit arrangements, physical data, weights, fan performance, dimensions, and coil ratings.

Buffalo Forge Co.

224—Low Silhouette Roof Ventilators

Catalog, 1961 edition, describes complete line of high efficiency gravity and power roof ventilators. Complete engineering and performance data cover rotary, stationary, directional, continuous ridge, and unit ventilators in the gravity series. Powered models include horizontal and vertical discharge types.

Western Engineering & Mfg. Co.

225—Flat-Oval Duct and Fittings

Flat-Oval duct and fittings designed for use where space limitations prevent the installation of circular duct for high pressure high velocity air systems. Sizes, complete set of matched fittings, pressure loss data and reinforcement to minimize amplitude of vibration and static pressure deflection are listed.

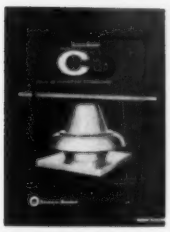
United Sheet Metal Co., Inc.

HEATING & VENTILATING EQUIPMENT *continued*

226—Infra-Red Panelbloc Heaters

Magazine article reprint, one of several covering many types of industry and various heating problems. These reprints cover general information on infra-red, discussing the physical properties of this electromagnetic energy which is ideal for heating. Specific installations show how *Panelbloc* utilizes infra-red.

Panelbloc Division, Bettcher Mfg. Corp.



227—Centrifugal Roof Ventilator

Bulletin 4104 gives description, selection, and dimensions of a new line of direct drive centrifugal roof ventilators. Low profile, spun aluminum construction. Nineteen basic units covering a range from 200 cfm to 2788 cfm. Provides efficient ventilation for many types of industrial buildings. Illustrated.

American-Standard Industrial Division.

228—Remote Air Cooled Condensers

Catalog 635 describes McQuay dual purpose air cooled condenser, exhaust, and/or heating and ventilating equipment. *Aircon* units provide the ultimate in flexibility by combining refrigerant condensing with heating and ventilating. Catalog covers applications, complete selection data, and specifications.

McQuay Inc.

229—Packaged Fan Units

Catalog 1160 Westinghouse's ventilating sets, packaged fan units ready to use. Typical applications are listed. Includes features, construction, velocity charts, performance tables, typical specifications, dimensions, and general application information. The units are illustrated together with component parts.

Westinghouse Electric Corp.

230—Oil Burner Chimney Guide

Engineering data guide, EM-306, gives simplified calculation procedure for selecting chimney sizes for I.B.R. approved cast iron boilers. Included are sample problems, calculation procedures for multiple boiler installations, information on special conditions, and general recommendations.

Weil-McLain Co.

231—Power Roof Ventilators

Bulletin 680-C describes *Sky-Blast* power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm.

Robbins & Myers, Inc., Propellair Div.

HIGHWAY, BRIDGE & STREET MATERIALS

232—Traffic and Safety Equipment

This illustrated brochure describes Planet's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside sign supports, bridge railings, and pedestrian overpasses. Standard Planet all-aluminum overhead sign structures are available in span lengths of 50 to 120 feet.

Planet Corp.

233—Roadway Lighting

Bulletin 60-158 gives full information, including dimensions on the new OV-50 *Silverliner* 700 and 1000 watt mercury luminaire. These streamlined units are designed for wider roadways and heavy traffic areas. With remote or built-in ballast OV-50 luminaires are suitable for downtown areas, highway interchanges.

Westinghouse Electric Corp.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

234—Steel Bridge Flooring

Illustrated four-page bulletin on open steel bridge flooring, includes detailed drawings of steel flooring, details of concrete floor plans, and field welding diagram. Also included are load tables and diagnosis of load distribution on four-way grid. Illustrations show ease of handling.

Kerrigan Iron Works, Inc.

HIGHWAY, BRIDGE & STREET MATERIALS continued

235—Soil-Cement Base for Paving

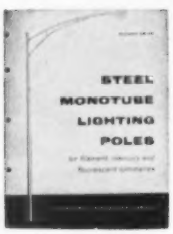
Bulletin SC110-8, published by Portland Cement Association, gives all the essential information on soil-cement for paving. This construction is used mainly as base for road, street, and airport paving in conjunction with bituminous wearing course. Normal range of cement requirements given. Illustrated.

Portland Cement Association.

236—Outdoor Lighting Developments

Catalog L-3 describes important developments in Pfaff & Kendall's outdoor lighting equipment. Gives attractive, functional light for the shopping center, service station, airport, restaurant, recreation area, and street. Many applications are pictured. Various types of standards and luminaires illustrated.

Pfaff & Kendall.



237—Steel Monotube Lighting Poles

Bulletin 29 presents new designs and data covering steel *Monotube* lighting poles for streets, highways, parking lots, shopping centers, and other locations. Poles are engineered for properly mounting today's modern luminaires. Similar information available in Bulletin LS-30 covering aluminum poles.

Union Metal Manufacturing Co.

238—Pavement Inspector's Manual

Bulletin R1-2-3, published by Portland Cement Association, is a manual for the concrete pavement inspector. Gives information and formulas for the inspector on the grade, at the plant, and at the paver. Also contains data on hot and cold weather construction, as well as a complete check list. Well illustrated.

Portland Cement Association.

239—Aluminum Lighting Standards

Kerrigan's new Catalog R-1 describes round tapered aluminum lighting standards. Covers shafts and arms for street, highway, bridge, and area lighting. Contains drawings and complete specifications. Also floodlight poles, traffic signal standards, and brackets and mast arms for wood, metal pole and wall mounting.

Kerrigan Iron Works Co.

240—Metal Grid Bridge Roadways

Irving decking catalog F-300 contains illustrations, descriptions and engineering data on open metal grid bridge roadways, with many of the advantages inherent in this type of bridge roadway, such as light weight, cleanliness, drainage, safety, durability, strength, traction, and economy.

Irving Subway Grating Co., Inc.

241—Safe, Slip-Proof Surfaces

This bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Included are methods of application. These anti-slip abrasives can also be used with epoxy resins to cover existing surfaces.

Exolon Co.

242—All-Aluminum Davit Standards

Bulletin ALS-40 describes Pfaff & Kendall's all-aluminum davit standards. While slim and graceful, these lighting standards are engineered to perform in a rugged, functional manner. Each type of standard is described and complete specifications are given. Includes information on how to order.

Pfaff & Kendall.

INDUSTRIAL PROCESSING EQUIPMENT

243—Automatic Processing Machinery

Case History describes how the Lynch Corp., working with Wayne Candies, Inc., has solved the problem of mechanical handling, weighing, and packaging of hard-to-handling items. Detailed are machines for weighing and packaging bulk candies, automatic packaging for fragile candy bars, and peanut sorting.

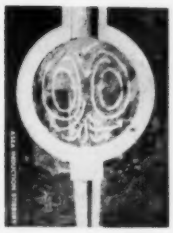
Lynch Corp.

244—"T-1" Steel

Bulletin ADUCO 01098-60 explains how USS "T-1" used in steel pressure vessels permitted the reduction of plate thickness to 1.109 and 1.075 inches. This was about 50% less than the quality steel previously used. Fabrication steps are given. Bulletin is illustrated in natural color. District sales offices listed.

United States Steel Corp.

INDUSTRIAL PROCESSING EQUIPMENT *continued*



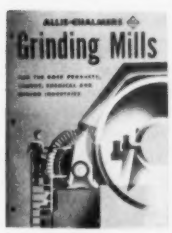
245—Induction Stirrers

Bulletin 7703E describes how much the fitting of an induction stirrer to your arc furnace will help you to cut your furnace time in many ways, thereby increasing your production, lowering your running costs, and improving the output of your furnace. A graphic illustration of the principles of induction stirring.
ASEA Electric, Inc.

246—Aero Fluid Cooler

Bulletin 120: photographs and diagrams show operation of *Aero* heat exchanger cooling liquids or gas with precise accuracy close to ambient wet bulb temperature. Fluid in closed system, uncontaminated, has heat removed at rate of input, holding uniform temperature, protected from freezing, automatically.
Niagara Blower Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.



247—Grinding Mills

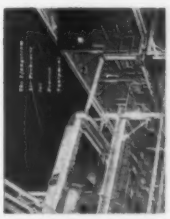
Consultants in rock products, chemicals, and mining will find bulletin 07B6718 a handy reference manual. Construction and application of grinding mills are thoroughly covered. Many charts and tables provide useful technical data. A separate section, 07B9607, highlights a *Twinducer* which cuts drive space.
Allis-Chalmers.

248—Process Heating and Cooling

Bulletin DPI explains the advantages of *Platecoil* heat transfer equipment in engineering, installation, operation, and maintenance of all kinds of tank and processing heating and cooling. Cutaways show construction and photographs show installations. Line drawings depict various applications.
Platecoil Division, Tranter Mfg., Inc.

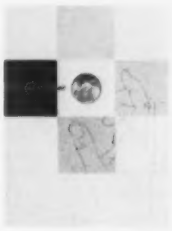
249—Yoloy Steel Plate and Sheet

Bulletin SPA-014A-560 describes Yoloy E steel plate and sheet. Features corrosion resistance, high strength, and weight reduction. Explains why alloyed steels are better, that intricate shapes can be readily cold formed from ductile Yoloy E steel. Applications pictured. Mechanical properties given.
Youngstown Sheet and Tube Co.



250—Process Equipment Preheater

Brochure entitled "The Ljungstrom Air Pre-Heater for Process Equipment" describes the fuel economy possible with this regenerator. Table of comparative fuel and power costs and graph clearly show these economies. Explains how added furnace capacity gives increased production and higher quality.
Air Preheater Corp.



251—Air Conditioning and Drying

Bulletin K-160 describes the latest model (Model C) *Kathabar* Air Conditioning and Drying Systems. The equipment is used to stop condensation; speed drying and other processing operations; obtain sub-freezing dew-points; make air sterile to hospital standards. Multicolor diagram shows operation. Fully illustrated.
Surface Combustion.

252—Industrial Radiant Heaters

Bulletin PE-70 gives product data on both *Vycor* brand tubular heaters and *Pyrex* brand panel heaters. These are two types of industrial heaters for drying, baking, heating, and curing. Bulletin contains pictures of typical installations, exploded view of heaters, and installation illustrations. Specifications given.
Corning Glass Works.

253—Gas Scrubbers

Bulletin AI-102 describes the centrifugal method of dry scrubbing natural gas as developed by Aerotec Industries. Includes dimensions, capacity charts, and formulas which permit the engineer to determine required sizes readily. Mist Extractor for use where excessive slugs of liquid are present in gas is described.
Aerotec Industries, Inc.

254—Recirculation of Cooling Water

Process Bulletin C2 describes the method for treating recirculating cooling water and process water systems plagued with hard-to-solve deposit problems. The Nalco method may be used alone, in conjunction with acid, or supplemented by some other Nalco treatment. Drawings shows installation.
Nalco Chemical Co.

255—Knitted Crusher

Bulletin 858 describes Knittel crusher with ring type double rotor. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations. The unit offers an exclusive crushing action that increases capacity, crushes wet sticky material without danger of plugging.
Stephens-Adamson Mfg. Co.

INDUSTRIAL PROCESSING EQUIPMENT *continued*

256—Tubing for Process Industries

Catalog CEC-60 covers carbon and stainless steel tubing, stainless steel pipe, and corrosion resistant electrical raceways for application in chemical and related industries. Method of processing, availability, and testing are discussed. Specifications information and corrosion data chart included.

Republic Steel, Steel and Tubes Division.

257—Tri-Ten Steel

Bulletin ADUCO 02048-60 describes Tri-Ten, high strength steels produced by the United States Steel Corporation. Its uses and advantages are explained. Includes mechanical property requirements, additional typical properties for engineering guidance, chemical composition, and fabricating practice for cold forming.

United States Steel Corp.

258—Steel Welding Fittings

Catalog H-2 provides information about the complete "Husky" line of carbon steel welding fittings for schedule 40 piping. Technical data is included for straight and reducing tees, concentric and eccentric reducers, 45° elbows, 90° elbows. Practical advantages of "Husky" fittings and performance tables.

NIBCO Inc.

259—Processing Equipment

Illustrated folder shows how multiple installation of Lynch *Morpac, Robo-Wrap,* and *Robo-Lift* automatic processing machines improved molding and packaging operations for a leading food manufacturer, increasing speed and productivity, using less floor space, decreasing rejects, reducing maintenance.

Lynch Corp.

INSTRUMENTS, CONTROLS and GAUGES

260—Electrical Operator

Bulletin B-7534 describes Westinghouse's electrical operator for remote control of types E, EH, F, and HF circuit breakers. Electric operator is same size and occupies the same amount of space as the breaker. Illustration with keyed dimensions. Schematic diagram shows circuit and operation. Applications.

Westinghouse Electric Corp.

263—Waterflow Indicators

Bulletin WF-4 describes Autocall's new Type WF-4 waterflow indicators. Adds automatic fire alarm feature. Photographs show ease of installation. Line drawing shows construction with components keyed caption. Dimensions are given on drawing. Quality construction features are listed and described.

Autocall Co.

261—Recording Annunciators

A new four-page bulletin describes recently introduced recording annunciator systems. Three basic models with 32, 64 and 1000 point maximums. Printed record includes specific condition; and month, day, hour, minute, and second of occurrence. Describes benefits of automatically printed records.

Scam Instrument Corp.

264—Emergency Controls

Catalogs 57-S6 and 57-S1 describe emergency controls for standby electric plants. Included in 57-S6 are automatic engine starting controls, load demand controls, battery chargers, gasoline engine remote control units, and paralleling, changeover and alternating panels. Automatic transfer switches in 57-S1.

Automatic Switch Co.

262—Electronic Handbook

Barber-Colman's new electronic control handbook is designed primarily for heating, ventilating, and air conditioning applications. It describes the many advantages gained through the application of electronic controls and instructs those who use it with a working knowledge of electronic control operation.

Barber-Colman Co.

265—Storage Tank Freeze Control

Catalog Section 4-B describes the new complete No-Freeze protection for outdoor water storage tanks. Lists advantages and explains principle of operation. Cutaway photograph of complete unit shows components. Submersible head containing the controls pictured. Switch mechanism illustrated.

Magnetrol Inc.

INSTRUMENTS, CONTROLS & GAUGES *continued*

266—Air Filter Gages

Bulletin C-1 presents the standard Dwyer line of filter gages. The consulting engineer's specification data is included for each of the three standard types of gages. These gages prvoide a continuous check on the efficiency of all types of filters. Various types are illustrated. Sales representatives are listed.

F. W. Dwyer Mfg. Co.

267—Buried Pipeline Detector

Bulletin PD describes Tinker and Rasor's transistorized Pearson-type Holiday detector for locating electrical contacts on pipelines, open couplings and discontinuities in coating, without uncovering the pipeline. Bulletin furnishes specifications, operating data and components. Photographs show use.

Tinker and Rasor.

268—Unitized Weighing Systems

Bulletins 30-40-50-60 describe four basic W&C unitized weighing systems: 1) Batch-Weighing, 2) Constant Feed Weighing, 3) Conveyor Scale, 4) Check-Weighing. All W&C components are pre-engineered and assembled in sections to save time and installation costs.

Weighing & Controls, Inc.
Subsidiary of CompuDyne Corp.

269—Water Level Recorders

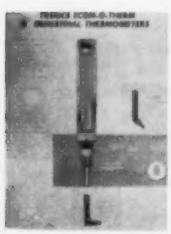
Bulletin 24, Eleventh Edition, describes the recently re-designed Type F Stevens recorder. Contains eight pages of illustrations and descriptive data. Applications data with information describing the new field-interchangeable clock drive is included. Also described is the Stevens Type FM weight driven recorder.

Leupold & Stevens Instruments, Inc.

270—Liquid Level Transmitter

Bulletin RI-1825 completely describes the new Yarway W-I-T unit for measuring liquid levels through pressure-tight walls without danger of leaks. Using a prestressed spring wire in a tube, the W-I-T level instrument provides snap switching action for alarms, fuel cut-offs for pumps. Drawings, photographs.

Yarnall-Waring Co.



271—Low Cost Thermometers

Bulletin 3100M describes a complete new line of thermometers, both mercury and dial indicating. Each thermometer offered is illustrated. Specifications and prices are charted. Panel drilling dimensions, standard ranges, and complete ordering information included. Sales offices in Canada and United States listed.

H. O. Trerice Co.

272—Pressure Controls

Bulletin 0-19 describes mercury switch equipped pressure controls incorporating 316 stainless steel bourbon tube with welded pressure connection. Outside adjustments, visible calibrated dial, visible on-off circuit position. Specifications and accessories for general purpose, weather-proof, explosion proof controls.

Mercoid Corp.

273—Isolating Switches

Revised Bulletin 910-143 gives details on ASCO's engine generator isolating switches. Used to by-pass automatic transfer switch and generating set in emergency power supply units without interrupting load circuits. Operation and construction details as well as current ratings, dimensions and prices.

Automatic Switch Co.

274—Liquid Level Controls

Sec. D2.1C describes electrode-type liquid level controls performing from one to five or more functions are included under name *Levalarms.* Illustrates improved designs, explains principle of operation-water conduction between electrodes of varying lengths, use of transformer-isolated currents.

Reliance Gauge Column Co.

275—Airport Control Lighting

Bulletin 2724 offers various types of airport lighting controls. Obstruction lighting, beacons, wind indicators, flush marker lights, and elevated runway and taxiway lights are described and illustrated. Other Crouse-Hinds products include photoelectric control, flashing switches, and many others.

Crouse-Hinds Co.

276—Momentary Contact Time Switch

Bulletin 80 describes Tork's momentary contact time switches for mechanically-held contactors and low voltage remote control. Three applications not previously adaptable to time control are outlined. Includes wiring diagrams and specifications. Enclosures illustrated and diagramed. Includes dimensions.

Tork Time Controls, Inc.

277—Space Saving Annunciators

Bulletin 103 illustrates and describes compact design economical annunciator for monitoring complex automatic equipment in utility and continuous process industries. Monitors 24 to 96 points. Designed for use with multi-point recorder. No drain circuit, flashing sequence, trouble-free operation, easy access.

Panellit, a division of ISI, Incorporated.

INSTRUMENTS, CONTROLS & GAUGES *continued*

278—Resistance Temperature-Indicator

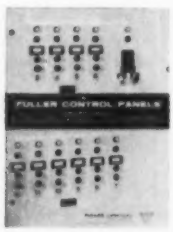
Bulletin 3047 describes the Edison resistance temperature detectors – stable, accurate, fast, sensitive, and rugged. Comparisons are made between the old type detectors and the new. Reliable temperature measurement is vital to modern industry. Operating principle, history, and advantages are included.

Thomas A. Edison Industries.

279—Electrical Controls

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls.

Zenith Electric Co.



280—Control Panels

Bulletin G-9 describes modern graphic panels for automatic handling of dry materials and process equipment control. Panels are designed and fabricated by manufacturer and are internally wired. Wiring diagram is furnished and supervision is normally furnished for start-up of system. Illustrated.

Fuller Co.

281—Temperature Regulators

Bulletin J180-1 describes OPW-Jordon's sliding gate temperature regulators. Self operated, pilot operated, and combination temperature pressure regulators detailed. Features, application, operation, rating tables, dimensions, and weights included. Cutaways show construction. Construction materials listed.

OPW-Jordon Corp.

282—High Voltage Motor Controller

Entirely new motor control development is described in booklet 14B9739. Among the engineering "firsts" described are two-high control center construction, complete drawout design, roll-out contactor, and flame-retardent. Track-resistant insulation used throughout. Engineering advancements fully described.

Allis-Chalmers.

283—Bi-Color Boiler Gauges

Bulletin 2044-A describes *"Multi-Port"* bi-color gauge MP 1050 for boilers operating at pressures up to 1050 psig. Water always shows green and steam red. Vision slot divided into series of round ports. This permits use of small glasses and small mica which are stronger and less sensitive to thermal stress.

Diamond Power Specialty Corp.

284—Instrumentation Capability

Booklet 800 shows examples of Liquidometer's experience in the design, development and production of electronic and electromechanical instruments and controls for a wide range of industrial applications. Included are tanks contents, gauges, and liquid level controls which measure virtually any liquid.

Liquidometer Corp.

285—Industrial Liquid Level Gauges

King-Gage Catalog 1010 gives details and specifications of hydrostatic gauges for measuring depth, volume, or weight of almost any liquid in any tank or processing vessel, under pressure or vacuum, from any desired location. Describes operation; shows applications in many industries; gives installation data.

King Engineering Corp.

286—Liquid, Steam, and Gas Controls

Bulletin C-50 describes pressure, flow, and liquid level controls for steam, air, water, oil, and gas. This condensed bulletin gives essential details on part of the McAlear line. Contains cutaways showing construction and components. Includes specifications on each control illustrated. Consultation for engineers.

McAlear Manufacturing Co.

287—Thermostatic Water Controls

Powers hospital catalog features a complete line of thermostatic water control equipment for therapeutic and other needs. Includes data dimensions and installation drawings. Designed for use in preparing plumbing plans and specifications. Can be used in conjunction with plumbing manufacturers catalogs.

Powers Regulator Co.

288—Complete Line of Gauges

Catalog 76-G illustrates and describes the comprehensive line of Marsh gauges. Covers case patterns and dimensions. Illustrates choice of easy reading dials and shows many recent improvements in pressure gauge design. Also includes solenoid valves and needle valves often used in applications requiring gauges.

Marsh Instrument Co.

289—Water Control Equipment

Bulletin 315 illustrates and provides specifications for the complete line of Sparling propeller-type main-line meters, recording instruments, and control equipment. Various applications, flow ranges, sizes, cut-away drawings, and installation information are all included. Pictured are production and test equipment.

Hersey-Sparling Meter Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

290—Automatic Metering System

Bulletin FL-56 describes Hetherington & Berner's *Fluidometer*, an automatic batch metering system. Adoptable to practically any liquid measuring problem. Equally accurate with high or low viscosities, eliminating waste. Shown in photo and diagram are direct control, remote control, dual valve, and multi-valve systems.
Hetherington & Berner Inc.

291—Solenoid Valves

New direct lift 2-way ASCO 8030A solenoid valves handle gas, air, water, steam, and other noncorrosive fluids at pressures to 4 psi, temperatures to 215°F. Valves are designed for any low pressure control system; handle gas to boilers; used as electrical checking devices for vacuum pumps and systems.
Automatic Switch Co.

292—Displacement-Type Level Control

Catalog Section 4A describes Magnetrol's displacement-type liquid level controls, top mounting with flanged or threaded connections. Photograph shows components and line drawing operation. Advantages, proper selection, information needed, dimensions, and specific gravity ranges. All models described.
Magnetrol, Inc.

293—Detector Specifying Guide

Specification Guide for electrical Holiday inspection in handy folder form contains information on types of detectors, inspection methods, and techniques. The guide includes other material to aid consulting engineers in obtaining adequate inspection of coating systems. Detectors are illustrated.
Tinker and Rasor.

294—Instrument Air Pressure Control

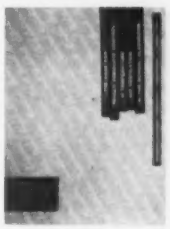
Bulletin 02 describes Mercoid's new pressure control, small in size and light in weight. Specifically designed for instrument air. Outside adjustment, calibrated dial and hermetically sealed contact. Operating ranges 1 to 20 and 1 to 30 psi. Cutaway shows construction. Wiring circuit and dimensions.
Mercoid Corp.

295—Hydrologic Instruments

Short Form Catalog No. 23 summarizes the Stevens line of hydrologic instruments and accessories. Included are descriptions and photographs of Stevens liquid flow recorders and indicators, liquid level recorders, telemetering systems; servo controls, precipitation recorders and gages, and accessory equipment.
Leupold & Stevens Instruments, Inc.

296—Monitoring Systems

Bulletin 1058 describes *Scammit* monitoring systems employing completely self-contained static switching components to eliminate component failure. Describes long system life, low initial cost, easy installation, and freedom of maintenance. Illustrates basic models and gives applications. Dimensions.
Scam Instrument Corp.



297—Classroom Ventilating Controls

Brochure F9975 describes the proper method for controlling unit ventilators in school classrooms. All the advantages of package controls, sampling chambers, ratio control, and plug-in wiring are discussed thoroughly along with other advantages obtained through electric and electronic control. Illustrated.
Barber-Colman Co.

298—Controls and Gages

The complete Gage and Control Catalog contains illustrations, prices and complete details on Dwyer *Magnehelic*, gages, manometers, air meters, air filter gages, pitot tubes, pressure actuated switches, flowmeters, combustion testing instruments. Diagrams, conversion curves, and other technical data.
F. W. Dwyer Mfg. Co.

299—Capacitance Level Controls

Bulletin describes *Prob-A-Larms*, a practical, low cost method of detecting and controlling quantities and levels of liquids, powders, and grains. High level alarm, low level alarm as well as high and low cycling for pumps or drains are common applications. Well illustrated.
Weighing & Controls, Inc.
Subsidiary of CompuDyne Corp.

300—Four-Way Solenoid Valves

Bulletin 8347 describes ASCO's new 3 position 4 way soleniod valves for use with double acting cylinders or air motors in all types of industrial equipment applications. Only 4 moving parts. Features dead tight seating for precise inching or full piston stroke. Eliminates cylinder piston drift.
Automatic Switch Co.

301—Float Operated Controls

Sec. D1.1B describes several types of float-operated devices for use with boilers or tanks to actuate electric warning signals such as lights, bells, or sirens. Certain combinations provide fuel cut-out service also. Two and three light signals and electric vibratory horns are listed as accessories. Wiring diagrams.
Reliance Gauge Column Co.

INSULATION & PROTECTIVE COATINGS

302—Polyurethane Insulation

Data sheet describes the new low temperature insulation for the temperature range of minus 300° to plus 225°F. A 85% closed cell product weighing approximately 2.3 lbs per cu ft with ak factor of .15 at 70° ambient. Lightweight, rugged, easy to apply. Can be vapor-proofed with standard materials.

Union Asbestos & Rubber Co.

303—Glass Fiber Insulation

Bulletin ULHT 360 describes *Ultralite*, Gustin-Bacon's rugged glass fiber insulation. Gives comparison of Btu losses, uninsulated versus insulated tanks. Includes features, examples, graphs, and application photographs. Complete details, line drawings, and photographs on two methods of insulating tanks.

Gustin-Bacon Mfg. Co.

304—Gilsulate Applications

Illustrated booklet S-88 gives the complete story of *Gilsulate;* what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating values. Also tells of the organization in back of *Gilsulate* — checking of piping layouts and soil conditions and supervision of installations.

American Gilsonite Co.

305—Flame-Retardent Polyethylene

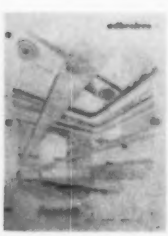
Technical bulletin RCT-710 deals with the historical development, flammability of polyethylene compositions, physical and electrical test data, properties, electrical characteristics, and processing of flame-retardent Polyethylene for wires and cables. Included are tabular data, bibliography, specifications, and charts.

Rome Cable Corp.

306—Coatings and Weather Protection

Bulletins M and MRC describe Foster's mastic coatings applied for weather protection of water absorptive materials for thermal insulation. The latter bulletin is a mastics reference chart including such data as description, coverage, drying time, service temperature, flash point, clean-up solvent, and other data.

Benjamin Foster Co.



307—Specialized Adhesives

Bulletins A and ARC describe Foster's adhesives used for lagging and insulation bonding. Gives facts and advantages of these specialized adhesives. The latter bulletin is a reference chart giving description, coverage, bonding time, service temperature, flash point, solvent for clean-up, and other pertinent information.

Benjamin Foster Co.

308—White Tank Enamel

Bulletin 8311 describes *Dulux*®, high build tank white enamel produced by DuPont. Looks whiter, dries faster, more build per coat. Information on use, surface preparation, application, thinning, priming, coverage, and availability. Bulletin also shows pictorially the use of *Dulux* on various types of tanks.

E. I. du Pont de Nemours & Co., Inc.

309—Silicone Rewind Savings

Bulletin R-10-215 reviews a case study showing how one company saved $5,000 in annual maintenance costs by specifying silicone insulated motors. Advantages of motors subjected to heavy duty cycles, shock loading, and high ambient temperatures are shown in a replacement analysis and cost comparison.

Dow Corning Corp.

310—Pipe Protection Tape

Bulletin introduces Tapecoat 20, an improved, hot-applied, pliable coal-tar coating in tape form, gauged for thickness. Includes polyester film outer wrapper. Designed for single-thickness application with minimum overlap. Easy to apply on pipe, joints and fittings, conduit, cable, insulated pipe, tie rods.

Tapecoat Co.

311—Formed Plastic Pipe Insulation

Bulletin II-143 describes Armstrong's *Armaflex* 22, an improved flexible, foamed plastic pipe insulation with built-in vapor barrier for dual temperature lines. Contains advantages, physical properties, insulation thickness recommendations, application procedures, available sizes, and thickness standards.

Armstrong Cork Co.

312—Permalex Insulation

Colorful brochure GEA-7047 describes the advantages of General Electric's *Permalex* insulation. You get 12 percent larger transformer with the same operating life and same investment. Advantages of using this insulation in pole-type distribution, large distribution, and network transformers is outlined.

General Electric Co.

313—Butyl Rubber

Twelve-page, two-color bulletin describes in detail Butyl rubber. Many applications of this rubber that stays "alive" are pictured. Many comparison graphs show effect of heat aging, electrical stability, shock absorption, sound damping, tear resistance, abrasion loss, gas permeability, and low temperature flexibilty.

Enjay Co., Inc.

INSULATION & PROTECTIVE COATINGS *continued*

314—Low Temperature Insulation

Bulletin 157-97-60 describes *Styrofoam*, Dow Chemical's superior low temperature insulation. Gives general characteristics, ordering information and complete engineering data. Includes specifications, heat transmission through walls in tabular form, guide to proper insulation. Installation procedures for applications.

Dow Chemical Co.

315—Pipe and Block Insulation

Bulletin describes new Urethane foam insulation for temp. —300°F to +220°F. Advantages of Unarco U-200 are outlined. Bulletin includes physical properties and general product specifications. Chemical reaction test results given. Actual job photographs. Other Unarco products described and pictured.

Union Asbestos & Rubber Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

316—Protective Metal Finishes

Bulletin 5115 describes *Dulux*® metal protective finishes, steel's best protector for over 30 years. Bulletin gives information on use, description, surface preparation, priming, thinning, application, recommended film thickness, coverage, and availability. Complete data is included for use of spray equipment.

E. I. du Pont de Nemours & Co., Inc.

317—Snap-On Pipe Insulation

"G-B Snap-On Pipe Insulation," eight-page booklet, describes characteristics and application data for one piece, fine-glass pipe insulation. Application specifications cover plumbing, heating, insulation of valves and fittings, cold piping, dual temperature, and outdoor piping. Thickness charts are also included.

Gustin-Bacon Manufacturing Co.

318—Coal-Tar Protective Tape

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection equivalent to a hot-applied coal-tar pipeline coating.

Tapecoat Co.

319—Temperature Indicating Paints

A paint that gives early warning of dangerous "hot spots" on processing equipment is the subject of this 4-page, illustrated bulletin, R-7-211. These silicone-based paints change color at any pre-determined temperature to 750°F. Added benefits are durable protection, attractive appearance.

Dow Corning Corp.

321—Commercial Fluorescent Lighting

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes use of Gilsulate by Caterpillar Tractor Co., gives a report on Gilsulate efficiency, and instructions for tamping the Gilsulate bed. Illustrated.

American Gilsonite Co.

LIGHTING FIXTURES & ACCESSORIES

320—Pipe Insulation News

This new Commercial Fluorescent lighting catalog, Bulletin C, describes special lighting unit for commercial establishments. The high lighting standards of modern classrooms, offices, stores, and other installations are met with these units. Diagrams of the various fixtures and tables of lighting statistics are shown.

Benjamin Div., Thomas Industries Inc.

322—Hinged and Framed Troffers

Specification Sheet 30 describes the hinged and framed troffer manufactured by the Wakefield Company. Photograph illustrates actual troffer and line drawing gives specific dimensions. ETL photometric report included. Line drawings show units to fit various ceiling constructions. Gives specifying points.

Wakefield Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

323—Fluorescent Lighting Fixtures

Bulletin OD-1051 Day-Brite's Fairview fluorescent lighting fixture that combines beauty with efficient lighting. Delivers today's footcandle levels while retaining the trim, sleek look. Fixtures are illustrated and line drawings show cross-section. Fairview application suggestions given and illustrated.

Day-Brite Lighting, Inc.

324—Flourescent Lamp Ballasts

Catalog LPC-1160 contains both a lamp and numerical listing of the full, diversified regular line of Universal "Service Guaranteed" ballasts. It features ballasts of low heat rise and thermal cut-out designs. Contains all electrical and physical characteristics including wiring diagrams and lead lengths.

Universal Manufacturing Corp.

325—Efficient Flourescent Lamps

Bulletin A-7263 describes Westinghouse high efficiency fluorescent lamps. Contains features, technical data, and comparative output chart. Typical applications for these lamps are listed and pictured. Advanced engineering achievements as plated leads, silicone coating, triple coiled electrodes are shown.

Westinghouse Electric Corp.

326—Indoor Luminaire Maintenance

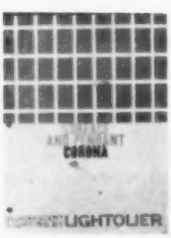
Safe low-cost floor-level servicing of high-bay luminaires is described and illustrated in Bulletin TH-57. The five basic requirements for a Thompson hanger installation, available hanger models, accessories, Underwriters' ratings, and range of applications also are outlined in detail. Illustrated.

Thompson Electric Co.

327—Fluorescent Ballast Distributors

A revised list of electrical wholesalers who stock Advance fluorescent lamp ballasts is available in Bulletin 1201, Revised. Wholesalers listed stock popular Advance ballasts and will replace inoperative in-warranty Advance ballasts free of charge. The warranty policy of the company is explained.

Advance Transformer Co.



328—Shallow Fluorescent Fixtures

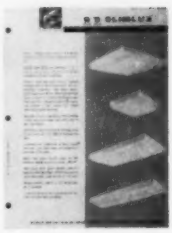
Catalog 32, "Surface and Pendant Corona", describes new shallow fluorescent unit which combines walnut and birch frame with expansive luminous styrene panel. Many sizes, distinctive appearance. For use wherever handsome lighting is called for – offices, residences, board rooms, reception areas.

Lightolier Inc.

329—Special Purpose Lighting Units

Folio 61-1, a 12 page booklet, describes mcPhilben's unique line of cast aluminum special purpose lighting units. Applications for vaportight, exterior, general interior use and directional signs. Includes specifications, drawings, and optional features to assist you in selection of quality lighting.

mcPhilben Lighting, Inc.



330—Slimlux Surface Modules

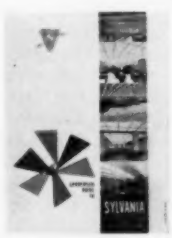
Five colorful specification sheets describe the new line of Guth *Slimlux* surface module fluorescent fixtures. Units available with four different side panels. Broad selection of bottom enclosures. Eight sizes. Each sheet contains lighting data, photographs, construction details, and engineering information.

Edwin F. Guth Co.

331—RLM Label and Programm

An answer guide to RLM labeled industrial lighting equipment has just been published for use of buyers and specifiers by the RLM Standards Institute. Pamphlet answers the most popularly asked questions concerning the RLM label and the RLM program. Reviews factors related to selection of lighting equipment.

RLM Standards Institute.



332—Fluorescent Fixture Catalog

Complete brochure V-602A covers the broad line of Sylvania commercial and industrial lighting fixtures, recessed shallow troffers and air-handling troffers plus translighted ceilings featuring plastic panel and louvered shieldings. This informative catalog provides a condensed description of all products.

Sylvania Electric Products Inc.

333—Air and Light Diffusers

Catalog F-9768 describes Air and Light Diffusers contained in one unit and manufactured by Barber Colman Co. and Day-Brite Lighting, Inc. Illustrated with line drawings showing construction and operation as well as photographs picturing various models. Includes acurate performance data for proper selection.

Barber-Colman Co.

334—Vaportight Lighting Fixtures

Bulletin 5-A describes Appleton's V-51 Series convertible, vaportight lighting fixtures. Shows how relamping, removing, or replacing reflectors can be done in a few seconds. Complete description and dimensional data on all parts and accessories plus cutaway views of the exclusive construction are included.

Appleton Electric Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

335—Lighting Duct

Bulletin ULD-660 describes BullDog's *Universal* lighting duct. Presents pictorially the components of this flexible lighting system which suspends and electrically energizes lighting fixtures and small power tools. Lists various types of duct, suspension equipment, and fittings.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

336—Emergency Lighting Units

Completely automatic, self-contained Exide *Lightguard* units give protection against hazards of sudden darkness. Bulletin 6456 describes full line of battery-powered units, from economy model through new high-capacity unit — for stores, restaurants, theatres, factories, offices, schools, institutions.

Exide Industrial Division.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

337—Shallow Line Troffers

Bulletin A is the most complete specification catalog ever offered on recessed troffer lighting. This new 4-⅞" deep troffer embodies features unequaled in the lighting field. A complete description of all these features is included together with complete ceiling drawings, illumination data, and technical specifications.

Benjamin Div., Thomas Industries Inc.

338—Injection-Molded Luminaire

Spec-Data sheet fully describes this new refracting luminaire, in four and eight foot lengths. The Photometric unit was developed for those who want the finest in engineered lighting. Contains limitations, specifying points for engineers, Photometric report, and accessories. Construction drawings and dimensions.

Wakefield Co.

339—Light and Air Diffusers

Catalog OD-1040 describes light and air diffusers in one unit. Line drawings show construction and operation of various types. Includes selection of illumination levels, installation planning, and fundamentals of fixture selection. Fixtures illustrated with specifications. Air distribution and lighting performance data.

Day-Brite Lighting, Inc.

340—Plexiglas Diffusers, Lenses

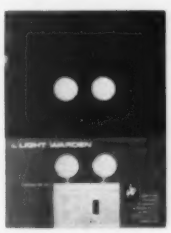
Bulletin PL-399 covers use of *Plexiglas* acrylic plastic for diffusers and lenses in lighting equipment. Lists grades, properties, colors, sizes. Includes light-transmittance and UV-transmittance graphs, spectrophotometric curves, design and installation details, distribution curves and coefficients of utilization data.

Rohm & Haas Co.

341—Flourescent Lamp Ballast

Bulletin B-1000, superseding B570-10, gives data and prices of Jefferson's fluorescent lamp ballasts. Included are wiring diagrams and complete specifications on rapid start ballasts of 60 cycle, normal power, and high power. Sound control chart helps you make the proper selection of lamp ballast.

Jefferson Electric Co.



342—Automatic Emergency Lighting

Bulletin describes Electric Cord Company's automatic emergency lighting that instantly provides illumination when regular power supply is interrupted. Various models listed with complete specifications. Includes exit lights, low voltage flood extensions, explosion proof heads, wall mounting brackets.

Electric Cord Co.

343—Interior Lighting Design

Booklet A-7235 is a 60-page, pocket-size manual on footcandle levels and interior lighting design. Contains valuable information including tables which apply to modern luminaires and light sources. Easy to use tables show luminaire, distribution, spacing, coefficients of utilization, and maintenance, factors.

Westinghouse Electric Corp.

344—Fluorescent Ballast Manual

Illustrated booklet M-1160 contains sections describing the purpose and manufacture of ballasts; various types of ballasts and their proper application; also the operation and care of ballasts. In the latter section, conditions of heat, cold, noise, voltage, and other factors are discussed with recommendations.

Universal Manufacturing Corp.

345—Outdoor Luminaire Maintenance

Safety and cost-saving features, typical installations, operating procedures, and available models of Thompson *Servisafe* pole and bracket units are covered in Bulletin PWB-59. *Servisafe* products permit fast hazard-free ground-level luminaire servicing by one man to assure year-round lighting efficiency.

Thompson Electric Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

346—Fluorescent Lamp Ballast Guide

Bulletin ATC-110 is a new fluorescent lamp ballast buyer's guide, listing the newest models. Included is electrical data, physical dimensions, and packaging of popular 60 cycle ballasts. All information is in tabular form for easy reference. Also includes conditions of sale and other pertinent information.
Advance Transformer Co.

347—Compact Exit Signs

Folio 60-2 introduces the newest, most compact, code regulated illuminated directionals. "50 line" EXITS by mcPhilben are all cast aluminum, glass or stencil face, incandescent or fluorescent. Wall, ceiling extending bracket, recessed or pendant series available. Contains specifications and engineering data.
mcPhilben Lighting Inc.

348—Fluorescent Lighting Fixtures

Guth specification sheet #4 describes the new line of surface and pendant mounted *Peerlite* fluorescent lighting fixtures. Your choice of various *Gratelite* bottoms in 2, 3, or 4 lamp fixtures, 4′ and 8′ lengths. Includes complete photometric data, installation information, and descriptive material.
Edwin F. Guth Co.

349—Recessed Incandescent Fixtures

Colorful new brochure 31 describing Lightolier's line of recessed incandescent downlighting, just released. Construction features are detailed with special emphasis on the exclusive *Duo-Style* trim flange, the new *Multi-Groove* baffle, the *Prismatex* low brightness lens. Technical data and ordering information.
Lightolier Inc.

350—Lighting Specifications Book

RLM standard specifications book (1960) for industrial lighting units includes three new specifications for 1500 ma-units; D-4 fluorescent semi-direct medium high mounting, SD-3AL semi-direct aluminum, and SD-3PE semi-direct procelain enamel units. Also many upward revisions of other existing specifications.
RLM Standards Institute.

351—Air Handling Troffers

Descriptive folder V-260 covers Sylvania's new and complete air-handling troffer line. Two-foot wide and one-foot wide troffers with several shielding types are available as supply and/or return units. Application information, air-handling, and photometric data are provided for typical units.
Sylvania Electric Products Inc.

MATERIALS HANDLING & STORAGE FACILITIES

352—Materials Handling Equipment

Sixteen-page, two-color bulletin 246 offers a definitive look at all Whiting materials handling equipment — overhead cranes, *Tranbeam* and *Pressuregrip* handling systems, and *Trackmobiles*. Fully illustrated booklet describes many outstanding design features of each product and shows how each is being used.
Whiting Corp.

353—Air-Powered Vibrating Feeders

Bulletin 1000 describes Cleveland's air-powered vibrating feeders designed to move with air and control the flow. Various types of feeders are illustrated. Sheet for outlining your requirements for proper feeder selection is enclosed. Bulletin outlines the many advantages of Cleveland feeders.
Cleveland Vibrating Co.

354—Moving Sidewalks and Ramps

Bulletin 1060 describes *Speedwalk* and *Speedramp* passenger conveyor systems from Stephens-Adamson. The literature presents comprehensive technical data, specifications, and illustrations of belt support and balustrade types. Also handrail and balustrade details, dimensions, and installation of moving sidewalks.
Stephens-Adamson Mfg. Co.

355—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton *"Auto-Signamatic"* systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.
Haughton Elevator Co.

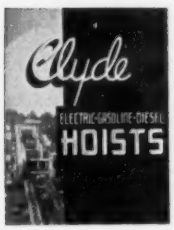
MATERIAL HANDLING & STORAGE FACILITIES *continued*

356—Belt Conveyors

Sales Manual, Page 3100, describes Barber-Greene's new *Redi Fab* belt conveyor series. Lengths from 18 to 240 feet and capacities to 480 tons per hour. Advantages are illustrated. Exploded line drawing shows construction. Various components are pictured and described. Accessories list and installation pictures.
Barber-Greene Co.

357—Conveyors and Elevators

Bulletin 358 describes Redler *En Masse* conveyor and elevators. Features comprehensive technical and engineering data, specifications, diagrams, and application photographs. Redler conveyor elevators can be applied horizontally, around bends, on inclines, and vertically for small particle handling.
Stephens-Adamson Mfg. Co.

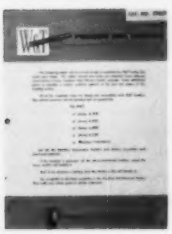


358—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities.
Clyde Iron Works, Inc.

359—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment. Describes Planet's creative service.
Planet Corp.



360—Materials Handling

Cats. 380.010 and 390.010 discuss problems in feeding dry, free-flowing solids. "Materials Handling" deals with moving material, bin design, hoppers, and spouts. "Feeder Selection" tabulates specifications of entire feeder line, lists characteristics of 175 common materials, offers convenient self-selection data.
Wallace & Tiernan Inc.

361—Pneumatic Materials Handling

Brochure SP-11001 describes and illustrates Halliburton pneumatic bulk materials handling systems for loading, conveying, transporting, and unloading powdered, granular, and most pelletized dry materials. Installations to date have handled products varying in density from 16 lbs to 168 lbs per cu ft.
Halliburton Co.

362—Trackmobiles

Bulletin T-132 is a full color, 20 page booklet which describes in story book form the exploits of *Tricky the Trackmobile*. It illustrates in a highly informative and entertaining manner the many functions a Whiting *Trackmobile* can perform both on and off the rails. Completely illustrated.
Whiting Corp.

363—Power Free Conveyors

Bulletin 960 describes Columbus McKinnon's *Power-Flex*, the power and free conveyor system with *Telematic* automatic dispatch control. Designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. Construction and opening features.
Columbus McKinnon Corp., Conveyor Div.

364—Crane and Hoist Electrification

Bulletin 76 tells why steel-enclosed Feedrail 60/90, 100/150, 225, 375 and 500 ampere crane and hoist electrification systems are specified. Advantages in design, in safety, in erection, and in performance are outlined. Includes photographs of typical installations and equipment descriptions.
Feedrail Corp.

365—Loading and Unloading Docks

Bulletin 450-15 points out that adequate dock facilities are an important materials handling tool. Lists companies served by Dravo-built docks. Installations of coal, ore, limestone, bulk materials, liquid cargo, steel, and multi-cargo docks are illustrated and described. Line drawings show typical layouts.
Dravo Corp.

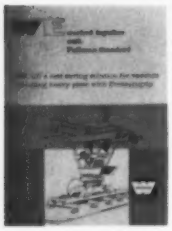
366—Pneumatic Conveying Systems

Bulletin 532 describes Dracco's airstream conveying systems. Versatile in performance and installation and profitable because of operational savings. Schematic chart shows flow of materials. Illustrated reports on plastics firms making large savings by bulk purchasing made possible through pneumatic conveying.
Dracco Division of Fuller Co.

367—Pneumatic Tube Systems

A 52-page handbook designed to aid consulting engineers in the selection of pneumatic tube systems. Industrial applications, variety of systems available, and engineering data are contained in this reference manual. Fully automatic systems with self-seeking carriers for all types of product handling.
Powers Regulator Co.

MATERIAL HANDLING & STORAGE FACILITIES *continued*



368—Vacuum Materials Handling

Bulletin V-102 describes how Whiting's *Pressuregrip* system is used to feed a power shear at Pullman-Standard's plant. Line drawings show material flow and actual photographs show equipment used. Many other applications of *Pressuregrip* are listed and pictured. Material of any shape easily handled.

Whiting Corp.

369—Tile Tanks and Linings

Bulletin A-160 outlines scope of complete engineering, installation, and maintenance service on tile-faced reinforced concrete tanks, chests, vats, silos, and others. Also includes a wide range of ceramic and membrane linings for resistance against corrosion and abrasion. Various types of tanks are illustrated.

Stebbins Engineering & Mfg. Co.

370—Cargo Containers

Bulletin ADUCO 02047-60 describes strong, lightweight cargo containers used in marine, trucking, and railroad applications. Explains that cargo containers must be able to take rough handling since they are used again and again. Use of USS *Cor-Ten* steel permits extra durability, stiffness with less weight.

United States Steel Corp.

371—Industrial Bulk Storage Tanks

Catalog 1839 features installation photos, specifications, and storage characteristics of Butler round, square, coated, and *Bulk-O-Matic* tanks for dry bulk commodities. A wide variety of bulk products being stored in Butler tanks include plastic pellets, sugar, roofing, granules, coal, and others.

Butler Manufacturing Co.

372—Escalators

Brochure 660 describes new line of Haughton escalators. Lists available sizes and corresponding capacities, with arrangement suggestions. Includes typical layout with minimum required dimensions. Pictures typical Haughton escalator applications. Factory branches listed.

Haughton Elevtator Co.,
Div. of Toledo Scale Corp.

373—Power and Free Conveyors

Bulletin 960 describes *Power-Flex* with *Telematic* automatic dispatch control, a power and free conveyor system. Applications include overhead gravity storage banks, manufacturing work stations, and others. Operating features of rail, chain, and trolleys shown in photographs. Typical conveyor system diagramed.

Columbus McKinnon Corp.

374—Revolver Cranes

Catalog 400-R-4 describes American revolver cranes for handling heavy materials. Capacity of 400 tons; adaptable to gantry, fixed, or barge mounting; for use with hook, bucket, magnet, or pile hammer. Contains many illustrations of American revolver cranes at work in varied situations. Typical assemblies shown.

American Hoist & Derrick Co.

375—Materials Conditioning Conveying

Bulletin G-3D describes Fuller rotary compressors, vacuum pumps, coolers, pre-heaters, blowers, fans, exhausters, and pneumatic conveyor systems for handling dry, pulverized, granular, and crushed materials. Illustrated with photographs and operational line drawings. Capacity and rating tables.

Fuller Co.

376—Transitubes for Hospitals

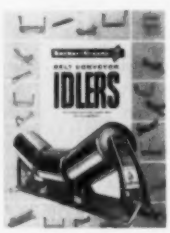
Bulletin E 21 describes pneumatic tube systems specially designed by The Grover Company for all types of hospitals. Systems range from small two-station directly connected types to the latest automatic installations linking a hundred or more stations. Illustrated.

Grover Co., Subsidiary of the
Powers Regulator Co.

377—Electronc Pneumatic Vibrators

Bulletin issued by the Cleveland Vibrator Company describes many types of pneumatic and electrically operated vibrators. All models shown in application photographs accompanied by descriptive captions. Two page spread shows vibrators for all concrete industry applications. Vibrating table types included.

Cleveland Vibrator Co.



378—Belt Conveyor Idlers

Sales Manual, Page 3200, describes belt conveyor idlers manufactured by Barber-Greene. Complete line is illustrated; and advantages are given. Cutaways show construction. Selection tables and instructions. Line drawings accompanied by tables of weights and dimensions. Standardized conveyor components shown.

Barber-Greene Co.

379—Curve Crown Pulleys

Bulletin 558 describes *Curve-Crown* welded, all-steel pulleys. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations on the S-A *Curve-Crown* welded, all-steel pulley. This revolutionary design offers maximum belt training effect and minimum belt wear.

Stephens-Adamson Mfg. Co.

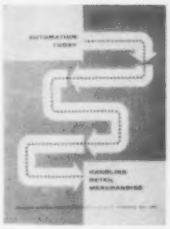
MATERIAL HANDLING & STORAGE FACILITIES *continued*

380—Feedrail Conveyor Systems

New catalog for consulting engineers Bulletin 60 describes 60 ampere Feedrail. This system is made up of standardized units, factory assembled for easy installation. Advantages are outlined. Design and construction are shown in cutaway photographs. Illustrated. Typical layouts and installation procedures.
Feedrail Corp.

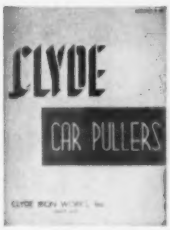
381—Gantry Cranes

This four-page booklet, bulletin 93, demonstrates how a gantry crane designed by Whiting for Bliss & Laughlin has increased furnace capacity 20%. It describes how four heat treating furnaces are loaded and unloaded in a fraction of the former time and points out handling and maintenance savings.
Whiting Corp.



382—Handling Retail Merchandise

Reprint of article from Automation magazine entitled "Handling Retail Merchandise". This is a case history of how a downtown St. Louis department store solved their merchandise handling problems through the use of Columbus McKinnon equipment. With text there is a schematic of system and photographs.
Columbus McKinnon Corp., Conveyor Div.



383—Car Pullers

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading.
Clyde Iron Works, Inc.

MECHANICAL POWER TRANSMISSION

384—Flexible Couplings

Flexible couplings in light, medium and heavy duty types to fit all standard applications are featured in new 24-page Catalog 61-A. Sizes and types from fractional to 8500 hp are illustrated and described, also spider and individual load type cushions which are engineered to service conditions.
Lovejoy Flexible Coupling Co.

385—Solid Shaft Gear Drives

Catalog 32 shows applications, specifications, and engineering details of right-angle solid shaft gear drives for centrifugal pumps and many industrial uses. Also describes *Redi-Torq* drive for use with auxiliary engine to automatically eliminate service interruptions due to power failure.
Johnson Gear & Mfg. Co., Ltd.

386—Universal Joints

Bulletin CS-10 describes and illustrates the five standard sizes of bevel gear universal joints available. For remote control of valves, pumps, engines, antennae, ventilators, equipment in inaccessible locations. Operate at any angle from 0° to 135° on vertical center line, or from 0° to 360° on horizontal center line.
Condenser Service & Engrg. Co., Inc.

387—Advances in Modern Gears

A 12-page bulletin which fully describes the advantages in using hardened and precision ground gears. Various applications such as radar-drive units, rotary-wing aircraft, high speed gas-turbine drives, dredge cutter drives, marine propulsion, and others are illustrated and their advantages discussed.
Philadelphia Gear Corp.

388—Gear-Type Couplings

Catalog 678-M65 describes the complete line of Fast's self-aligning, gear-type couplings and acquaints you with both standard and special couplings. The Fast principle is explained and cutaways show components and operation. All types of couplings are illustrated with application explanations. Special designs.
Koppers Co., Inc.

389—Fluid Drives

Bulletin A-719 describes American-Standard's *Gyrol* fluid drive for forced draft fan, centrifugal compressors, and other applications. Principles of fluid drive explained and illustrated with photographs and schematics. Installations, advantages, components, selection charts, dimensions included. Ordering data.
American-Standard Industrial Division.

MECHANICAL POWER TRANSMISSION *continued*

390—Universal Joints

New line of universal joints in a wide range of sizes and types for all industrial applications up to 1750 rpm featured in 8-page Catalog 61-D. Includes illustrations, drawings, and data on standard and heavy duty types rated at .35 to 190 hp at 100 rpm, also booted joints and specials to order.

Lovejoy Flexible Coupling Co.

391—Turbine Pump Drives

Bulletin 31 describes Johnson's right angle turbine pump drives, in standard and combination drive installations, in a wide range of models to meet specific requirements of prime movers and pumps. Introduces new *Redi-Torq* automatic combination drive. Illustrations, power ratings, and average efficiencies.

Johnson Gear & Manufacturing Co., Ltd.

MEETINGS, CONVENTIONS & TRAVEL

392—Chicago, Illinois

Folder describes the Acres Motel located on U. S. Route 41 in Chicago, Illinois. A convenient location whether you are headed north, south, or west. A few minutes drive from Chicago's Near North Side and only twenty minutes from the Loop. Swimming pool, TV, fine restaurant, individual temperature controls.

The Acres Motel.

396—Minneapolis, Minnesota

Colorful booklet describes and pictures the facilities of the Pick-Nicollet hotel in Minneapolis. Ideal facilities for conventions, meetings, and trade shows. Services include PA systems, television, moving picture projection, and other special equipment in this 600 room hotel. Booklet shows modern decor.

Pick-Nicollet.

393—Galveston, Texas

Folder describes Hotel Galvez and Villa located less than one hour drive from Houston via super highway. Thirty mile beach, swimming pool, fishing, horseback riding, tennis and golf are offered for recreation. Completely air conditioned. Facilities of Moody Center available for conventions up to 3500 persons.

Hotel Galvez.

397—Mobile, Alabama

Folder describes Hotel Admiral Semmes located in Mobile, Alabama, the Azalea City and one of America's most interesting old cities. A warm and friendly atmosphere and accommodations offer the utmost in comfort and pleasure. Completely air conditioned, television and radio, automobile entrance.

Hotel Admiral Semmes.

394—Point Clear, Alabama

Grand Hotel, Point Clear on Mobile Bay, Alabama, offers colorful booklet on the facilities they provide for the vacationer. An eighteen hole golf course has clubhouse with complete facilities for entertaining. Cruising, fishing, dancing, tennis, and swimming for recreation. Exquisite cuisine and flawless service.

Grand Hotel.

398—Fort Lauderdale, Florida

Folder describes Ruttger's By The Sea in Fort Lauderdale, Florida. Printed in full color, this folder shows deep sea fishing, swimming pool, relaxing areas, and beach facilities. Typical room, lounge, and dining room also shown. Nearby golfing, horse racing, Jai-Alai, and dog racing for entertainment.

Ruttger's By The Sea.

395—Washington, D. C.

Hotel Washington offers relaxed living. You can drive right into the hotel, via the motor lobby entrance and private registration desk. Dress as you please, your privacy is assured. Smart cocktail lounge, sky terrace, beautifully decorated modern rooms, superb food. Heart of shopping and theatrical districts.

Hotel Washington.

399—Birmingham, Alabama

Folder describes the facilities of Hotel Thomas Jefferson in Birmingham, Alabama. Rich, but unobtrusive, decor in luxurious suites is perfect for entertaining that special client. Completely air conditioned. TV, radio. Excellent meeting rooms make this hotel Birmingham's convention headquarters. Excellent food.

Hotel Thomas Jefferson.

MEETINGS, CONVENTIONS & TRAVEL *continued*

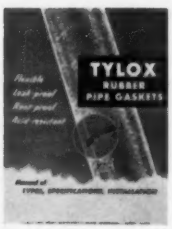
400—Alabama Convention Spot

Grand Hotel, with its adjacent Lakewood Golf Club, each year is host to numerous corporation board meetings and sales conferences, as well as to many smaller executive and golfing groups. For those desiring complete information we have a special convention kit. Delightful location, excellent cuisine.
Grand Hotel.

401—Chicago, Illinois

Folder describes the Acres Motel located at 5600 North Lincoln Avenue on U. S. Route 41 in Chicago, Illinois. Accommodations for every taste — single rooms, double rooms, kitchenettes, and apartments. Rooms have individual temperature control. Fine restaurant, swimming pool, and TV. Close to shopping center.
The Acres Motel.

PIPING, VALVES & PLUMBING SUPPLIES



402—Rubber Sewer Pipe Joints

A 16-page technical manual in color fully describes, illustrates, and diagrams the full line of *Tylox*® rubber and neoprene gaskets for coupling any type of concrete sewer pipe. *Tylox*® physical properties, guides for writing rubber joint specifications, and tips on *Tylox*®-jointed pipe installation are also included.
Hamilton Kent Manufacturing Co.

403—Gear Operators

Bulletin AD-2441 describes Crane's new weatherproof *Converto-Gear*® operator for converting many Crane iron and steel gate valves to gear operation in less than 30 minutes. Shows dimensions and illustrates step-by-step procedure for installing unit on outside crew and yoke and non-rising stem gate valves.
Crane Co., Industrial Products Group.

404—Bronze Ball Valves

Bulletin DH-38 describes new forged naval bronze ball valve with *Auto-mating* seats which insure positive seating. Bune "N" seats impregnated with molybdenum disulphide insure a slippery, non-galling surface. Wiping action of ball forces out foreign matter, prevents wear.
R-P&C Valve Division,
American Chain & Cable Co., Inc.

405—River Crossing Pipe

Booklet L-115 describes American *Molox* ball joint pipe for river crossings and other difficult installations. Map shows various locations of installations. Gives description, suggestions for use, method of assembling. Many pictures are used showing actual installing of pipe. Complete specifications on all diameters.
American Cast Iron Pipe Co.

406—Three-Way Mixing Valves

Bulletins V-214 and V-215 describe pneumatically operated three-way valves for mixing liquids at different temperatures. Design provides constant total capacity, positive seating, allows straight-away piping hookup. Can be serviced without removing valve body. Sizes from 2½" to 6", pressures to 250 psi.
Johnson Service Co.

407—Glass-Lined Sewer Pipe

Folder deals with the glass-lined sewer pipe with a mechanical joint. *Amvit Glas-Glaz* pipe is available in 4-ft lengths. It is root and infiltration proof and is glass coated inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer. Assembly operations shown.
American Vitrified Products Co.

408—Lubricated Plug Valves

Catalog PV-6 covers the full line of Powell steel and semi-steel lubricated plug valves. Profusely illustrated, it shows and describes all available types of valves, lists pressures and sizes, and gives complete dimensions. Installation, operating, and maintenance information, and component parts lists.
Wm. Powell Co.

409—Solder Joint Valves

Bulletin 581 describes the uses and construction features found in Kennedy solder joint valves for copper tubing installations. Cutaways, keyed to copy, show operation. Also gives detailed dimensions and instructions on installation. These valves for use on types K, L and M copper tubing.
Kennedy Valve Mfg. Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

410—Lubricated Plug Valves

How ACF lubricated plug valves can save money and add efficiency to hot and chilled water air conditioning systems is described in Bulletin AP 1059. These valves are ideal for use as balancing cocks, condenser return, boiler and chiller feed, gas, water, or oil supply valves. Illustrated.

W-K-M, Division of ACF Industries, Inc.

411—Strainers

Bulletin SS-21C gives data on complete line of strainers for steam, air, gas, oil, and water lines. Available in semi-steel, cast steel, bronze, block steel, and new ductile (nodular) iron. For collection of dirt, scale, and other foreign matter in the line, preventing clogging and damage to systems and equipment.

Strong, Carlisle & Hammond.

412—Electric Check Valves

Bulletin W-10A describes the G-A Electric Double-Cushion Check Valve that does not open until pump comes up to speed. Starts closing while pump is running, and when 95% closed, shuts down pump, eliminating shock. Includes ordering requirements, dimensions on globe and angle cross-section views.

Golden Anderson Valve Specialty Co.

413—Insulating Union Meter Stops

Bulletin 9023 describes the Mueller insulating union gas meter stop. This effective electrical insulator is now available in the form of a union on five popular meter stops. The features of this insulating union and tests it has been subjected to are illustrated and described in detail.

Mueller Co.

414—Wafer Butterfly Valves

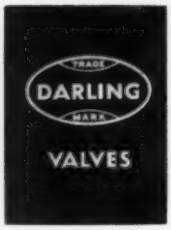
Bulletin 583 contains information for easy selection of the valve needed for required pressure drop in the size and construction for air, gas, or liquid lines. Valves are pictured and diagrams show construction. Allowable pressure drop for Rockwell's seven classes of valves are charted. Control methods described.

W. S. Rockwell Co.

415—Pump and Compressor Connector

Bulletin FP-4 describes *Flexpipe*, the flexible connector for pumps and compressors. *Flexpipe* connectors dampen noise and vibration and permit expansion and contraction in piping. Engineering data, sizes, and part numbers are included. Diversified applications shown in photographs.

Anaconda Metal Hose Division.



416—Gate and Check Valves

Catalog 57 describes Darling's line of gate valves and check valves in iron, bronze, steel, and special alloys for all types of valve application. Also included are fire hydrants and accessories for fire protection. This 244 page bound volume gives specifications, pictures, facilities, and illustrates product applications.

Darling Valve & Manufacturing Co.

417—Fabricated Pipe Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor. Suggested arrangements.

Naylor Pipe Co.

418—Flush-To-Wall Water Cooler

Form WC-15 describes Haws electric water cooler Model HWF-13, with detail drawings, capacities, accessories, and listing applicable government standards. Model HWF-13 mounts flush-to-wall with no waste space or exposed plumbing, using only 1½ sq ft floor space. Capacity of 12.5 gph serves 150 people.

Haws Drinking Faucet Co.

419—Butterfly Valves

Condensed Bulletin 50-1 illustrates wide selection of body designs and ratings of Continental butterfly valves. Cross index system permits quick selection of valve best suited for any requirement or application. Bulletin also shows several special designs to handle unusual problems.

Continental Equipment Co.
Division of Fisher Governor Co.

420—Steam-Jacketed Valves

Bulletin E-200 describes Everlasting's steam-jacketed valves ideally suited to handling different types of viscous materials. Cutaway shows construction and operation. Exploded view shows components and arrangement of parts. Includes list of features, application photographs, and side and end views.

Everlasting Valve Co.

421—Continuous Weld, Seamless Pipe

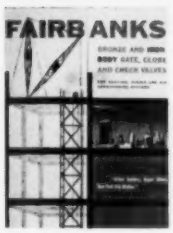
Bulletin SPA-081-960 describes Yoloy pipe, the longer lasting, corrosion resistant steel pipe. For better resistance to atmospheric corrosion, soil corrosion, and chemical corrosion. Contains comparison graphs and tabular data on tests. Specifications for Yoloy steel pipe given. File tabbed for easy reference.

Youngstown Sheet and Tube Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

422—Electric Zoning Valve

Bulletin 2120-5 describes Hush-A-Matic, electric zoning valve for wet systems, manufactured by the Hays Manufacturing Company. Widely used in hotels, hospitals, public buildings, and offices. Includes features, dimensions with dimensial diagrams, and flow capacity chart. Explicit instructions for ordering.
Hays Manufacturing Co.



423—Valve Catalog

Bulletin V-6 is a condensed catalog of the more popular Fairbanks valves used in heating, piping, and air conditioning systems. Includes bronze and iron body gate, globe, and check valves with pressure ratings from 125 lb to 300 lb. Each valve illustrated and sizes available and basic descriptions provided.
Fairbanks Co.

424—Drinking Fountains and Coolers

Catalog describes Halsey W. Taylor's drinking fountains, electric water coolers, counter top fountains, and pedestal fountains. Illustration of each model is accompanied by dimensional line drawing. Construction features are described and illustrated. Types of fountain heads and projectors included.
Halsey W. Taylor Co.

425—Precision Control Valves

Catalog A243 describes all types of precision control valves manufactured by the Kohler Co. Cutaways and exploded views show construction and operation of various types of valves. Sizes and engineering data in table form is included. The many valve applications are listed. Branch sales office addresses given.
Kohler Co.

426—Saran-Lined Piping Systems

Bulletin 153-84-60 describes *Saran*-lined pipe, fittings, valves, and pumps distributed by Saran Lined Pipe Company. Gives industrial applications, advantages, and dimensions. Fittings, valves, and pumps illustrated with photographs and schematics. Schematics show operation, construction. *Saran* liner properties.
Dow Chemical Co.

427—Insulated Piping Systems

The new edition of the Ric-wiL product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include *Hel-cor, Uniline, Type* J, and cast iron. Prefabricated accessories are also included.
Ric-wiL, Inc.

428—Ball-Type Flexible Struts

Catalog 229A describes Barco's ball type flexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications.
Barco Manufacturing Co.

429—Rubber Seat Ball Valves

Catalog BA-1 describes the new Pratt rubber seat ball valve in sizes from 10" through 48". Available in 150 psi and 250 psi designs. Features, applications, construction, and dimensions. Rubber seat provides bubble-tight closure and long life. Remarkably easy to operate. Manual, cylinder motor operators.
Henry Pratt Co.

430—Fibre Pipe and Fittings

Catalog No. 307 describes Orangeburg pipe and fittings and Orangeburg perforated pipe. Outlined are their many uses and advantages for underground non-pressure applications outside the dwelling. Pipe, fittings, and adapters are illustrated and accompanied by specifications.
Orangeburg Manufacturing Co.

431—Stainless Steel Needle Valves

Bulletin NV-3 describes new line of Marsh needle throttling valves made of 316 stainless steel. Line opens up wider range of corrosion-resistant application. Valves are designed to give accurate throttling and positive shut-off at any pressure through 600 psi, any temperature from -100° F to plus 500° F.
Marsh Instrument Co.

432—Hot Water Balancing Valve

Bulletin 204 describes *Illinois* dual-purpose balancing valve that performs job of both gate valve in a return line and balancing valve. Advantages include labor-saving installation and maintenance. Cutaway shows components and construction. Line drawings picture operation. Dimensions and specifications.
American Air Filter Co., Inc.

433—Valve Controls

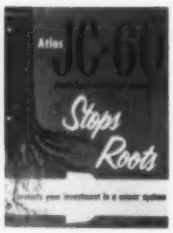
Bulletin 1-60 fully describes the most popular type of *Limitorque* Valve Operator. What *Limitorque* is, does, and operates are clearly explained. Also, contained are complete dimensions and parts lists with drawings. Preferred mounting positions, operating tips and supplementary equipment illustrated.
Philadelphia Gear Corp.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

434—Jacketed Pipe and Fittings

Bulletin J-57 describes pipe, welded steel fittings, spring loaded plug valves, and valves all jacked, manufactured by Hetherington & Berner Inc. Different types of valves and fittings are illustrated together with cutaway photographs showing construction and operation. Also jacketed pumps and flexible hose.

Hetherington & Berner Inc.



435—Plastic Sewer Joint Compound

Bulletin M20-3 describes Atlas JC-60, a hot melt sewer joint compound that has been a leader for 50 years. The bulletin describes its many advantages, directions for use, properties, and estimating charts. Protects against most common causes of joint failure. Application photographs are included.

Atlas Mineral Products Co.

436—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

Speedline Fittings Division, Horace T. Potts Co.

437—Asbestos-Cement Pressure Pipe

All standard sizes and classes of asbestos-cement pressure pipe are listed in illustrated 4-page folder AP-27. Folder cites low costs of transportation, installation and maintenance; describes patented *Fluid-Tite* coupling that forms a permanently, automatically leak-tight seal. Standard sizes and classes listed.

Keasbey & Mattison Co.

438—Plumbing Fixtures

A condensed catalog containing pictorial illustration and complete dimensions of Crane fixtures available for schools, hospitals, industrial plants, institutions, and all types of commercial buildings. This handy booklet includes description of product and mounting features that will help to determine application.

Crane Co.

439—Steel Pipe and Couplings

This new bulletin gives sizes, lengths, threads, weights, and carton contents of merchant, half and API line pipe couplings plus other information including complete specifications on standard, extra strong, double extra strong, and structural pipe. Illustrated and printed in two colors on durable stock.

Wheatland Steel Products Co.

440—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

441—Soil Compaction

Foundations on sand are described in booklet "Soil Compaction by Vibroflotation". Contents cover application and operation, soil consolidation examples, data on specifications, excavations and test pits. Detailed drawings show *Vibroflot* machine in operation and typical compaction pattern for required density.

Vibroflotation Foundation Co.

442—Non-Corrosive Drainline

Booklet gives all necessary information on Vulcathene integrated drainline system which includes pipe, fittings, traps, and sinks. Includes recommended uses, advantages, characteristics, layout, and design. All types of drainline fittings are illustrated and give dimensional information. Accessories listed.

American Vulcathene Div.

443—Sliding Gate Control Valves

Bulletin J170-1 describes OPW-Jordon's sliding gate control valves. Includes features, applications, capacities, dimensions, flow characteristics, construction materials, operating characteristics, sizing charts, specifications, and weights. Cutaways show components and operation. Contains ordering instructions.

OPW-Jordan Corp.

444—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of bell and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves.

R. D. Wood Co.

445—Valves

Bulletin V-1 describes in condensed form the various types of valves manufactured by Schutte & Koerting. Outlined in detail are check valves, back pressure valves, reducing valves, butterfly valves, bypass valves, and instant-acting valves. Other S-K valves are listed. Line drawings show operation of various valves.

Schutte & Koerting Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

446—Impulse Steam Traps

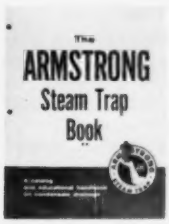
This 2-page flyer provides complete specifications on the new Yarway Series 130 impulse steam trap for light condensate loads. It also lists the advantages of this unique steam trap in combining strainer, blow-down valve, and trap in a single, compact body and thereby eliminating up to six piping connections.

Yarnall-Waring Co.

447—Pressure Reducing Valves

Bulletin 228 describes pilot-operated pressure reducing valves manufactured by McAlear. Includes features, construction, operating pressures, capacity chart, roughing-in dimensions, and exploded view showing parts and assembly. Line drawing shows correct installation position. Operation illustrated and described.

McAlear Manufacturing Co.



448—Steam Traps

Catalog K describes Armstrong's steam traps. Gives pertinent general information. Lists features and gives complete details on various types of traps. Cutaways show operation, drawings show dimensions, and tables give specifications. Selection data includes capacity chart, graphs, tables, and drawings.

Armstrong Machine Works.

449—Three-Way By-Pass Valves

Bulletins V-210 and V-211 describe pneumatically operated three-way, by-pass valves for liquids. Design permits servicing without removing valve body, cuts upkeep costs and downtime. Provides 100% tight shutoff and proportional or two-position action. Sizes from 2½ to 6 inches, pressures to 250 psi.

Johnson Service Co.

450—Jointed Vitrified Clay Pipe

Jointed vitrified clay pipe known as *Amvit*, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.

451—Bar Stock Valves.

Bulletin DH-766-B gives complete information on K-P&C bar stock valves. Available in a range of metals and sizes for applications requiring close control valves capable of withstanding a wide range of working temperatures and pressures. Completely illustrated.

American Chain & Cable Co., Inc.
R-P&C Valves Division.

452—Gate Valves

Bulletin VC3-H describes a new gate valve that can be throttled like a globe. Tables showing rating, pressure, operating temperatures, and many uses are included. Available in both solder end and threaded end. The size range is listed along with dimensions and cutaways. Air, water, oil and gas.

NIBCO Inc.

453—Vitrified Clay Pipe

Bulletin PS-101 describes Kaul Clay Company's *Presto SEAL* vitrified clay pipe. Socket and spigot ends are factory-molded polyester, with a rubber gasket permanently imbedded in the socket end. When socket and spigot ends of pipe are joined, a perfect, permanent, flexible seal is made in seconds.

Kaul Clay Co.

454—Jointing Flexible Gaskets

Technical brochure describes and illustrates the use of "Tylox C" and "C-P" sewer pipe jointing flexible gaskets. Gaskets are for single or double offset pipe of all sizes. Diagrams show gaskets properly positioned and under full compression. Photographs show installation procedures. Coupling methods diagramed.

Hamilton Kent Manufacturing Co.

455—Valves and Fittings

Catalog 60, a 444 page, case bound book, describes and illustrates the complete line of valves and fittings manufactured by Crane Co. Includes weights, dimensions, and working pressures. A large section is devoted to engineering data including flow of fluids, charts, and conversion tables.

Crane Co., Industrial Products Group.

456—Valves All Types

Bulletin 216 is condensed and compact catalog which describes the Powell line of bronze, iron, steel, alloy, lubricated valves, liquid level gauges and other specialties. All products listed are illustrated. Cutaways show construction details. Available sizes, pressure and temperature ratings listed.

Wm. Powell Co.

457—Eccentric Plug Valves

The newest W-K-M product, the eccentric plug valve is described in Bulletin AE-1059-B. Amazingly simple in design, construction, and operation, the EC Valve is ideal for sewage and waterworks services. Sizes available now are ¾" through 12" with larger sizes on application; working pressure — 150 lbs.

W-K-M, Division of ACF Industries, Inc.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

458—Iron Pipe Tubing, and Fittings

Catalog L-127 describes the complete line of American ductile iron pipe, tubing, casings, fittings, and special castings. Includes valuable technical information; grades, specifications, dimensions, and weights. Typical applications include underground piping, industrial piping, well casing, and many others.

American Cast Iron Pipe Co.

461—Valves for General Services

Bulletin 573 shows the many new construction features of the Kennedy 125-lb gate valve in cylindrical body construction. Cutaway shows construction and operation. Additional features include new hex end design, Kenalloy stem and handwheel. Conform to Federal Specifications WW-V-54 Type 2 Class A.

Kennedy Valve Mfg. Co.

459—Butterfly Valves

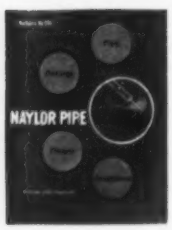
Bulletin 5904 is a comprehensive 36-page catalog on Darling-Pelton rubber seated butterfly valves and operators. Catalog contains information on Darling-Pelton valves, designed in accordance with AWWA specifications for hydrostatic operating pressures up to 125 psi and velocities up to 16 feet per second.

Darling Valve & Manufacturing Co.

462—Emergency Safety Equipment

Bulletin SS46 describes complete line of Strong continuous flow ball float traps. Application data, list prices, detailed specifications, dimensions, cutaway drawings, capacities, and installation diagrams are included. New steel and semi-steel side-inlet models, with wide pressure-temperature limits included.

Strong, Carlisle & Hammond.



460—Lightweight Pipe and Fittings

New 8-page condensed catalog summarizes complete line of Naylor lightweight pipe, fittings, flanges, and connections. Lists typical applications. Includes standard specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines.

Naylor Pipe Co.

463—Standard Steel Pipe

Bulletin WS-1A describes the G-A Double Cushioned Check Valve that prevents damaging hammer and shock due to back surge. Installation is recommended on boiler feed lines, steam pumps, compressors and reciprocating pumps. Water, oil, gas and other fluids can be handled. Technical illustrations.

Golden Anderson Valve Specialty Co.

464—Bronze Gate Valves

Bulletin E-165 describes Everlasting valves for general services. Classified index gives type, typical service, and page number. Distinctive features of Everlasting valves outline and illustrated with cutaway and exploded view. Special arrangements, duplex boiler blow-off units and parts lists included.

Everlasting Valve Co.

467—Curb Valves

Bulletin 9010 describes the Mueller *Oriseal* curb valve. This ideal curb valve features easy turning after prolonged idleness, lifetime pressure sealing, long cycle life, and permanent lubrication without grease. Features are illustrated with full color cutaway and described. Specifications included.

Mueller Co.

465—Ball Float Traps

Catalog 360 describes Haws complete line of emergency eye/face-wash fountains and safety drench showers. Immediate first aid protection against acids, chemicals, and volatile fuels. Many models, in iron, china, stainless steel, for all industrial applications. Complete specifications and detail drawings included.

Haws Drinking Faucet Co.

468—Diaphragm-Disc Valves

Bulletin 800C describes Rockwell's D-D Diaphragm-disc valves, flanged type, screwed type, and union ends type. Includes advantages, construction, specifications, dimensions, water capacities, correction factors, and typical flow characteristics. Cutaways show construction and operation. Photographs of valve types.

W. S. Rockwell Co.

466—Hydraulic Check Valves

Bulletin SPA-034-260 describes Buckeye and Yoloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical properties are given. Photographs show installation while buildings are under construction. Conform with the requirements of Underwriters Laboratories.

Youngstown Sheet and Tube Co.

469—Wet Heating Connectors

Bulletin FP-5 describes Anaconda Flexpipe connectors used to compensate for travel, absorb vibration, and connect misaligned ports in piping in wet heating systems. Made of tin-bronze and available in standard sizes. Cross-section shows construction. Typical uses are detailed and illustrated.

Anaconda Metal Hose Division.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

470—Diaphragm Control Valves

Bulletin E-657A describes Fisher diaphragm control valves with iron, steel, or alloy bodies for all temperature, pressure, and corrosive conditions. Direct and reverse acting spring and pressure balanced top-works are listed and a section providing tubular material to aid in valve selection is included.
Fisher Governor Co.

472—Flow Control Valves

Bulletin 2305-7 describes Mesurflo control valve which automatically compensates for pressure surge and pressure drop to maintain one constant flow rate. Typical applications are described and pictured. Gives features, typical flow chart, dimensions with dimensional drawings and photographs.
Hays Manufacturing Co.

471—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from ¼ inch to 12 inches, including high temperature steel piping.
Barco Manufacturing Co.

473—Bronze Gate Valves

Bulletin V-126 describes Fairbanks patented 200 lb bronze gate valves in which the nickel alloy seat rings can be replaced in from 7 to 10 minutes without the need of ever removing the valve body from the line. Replacement illustrated step by step. Cutaway photographs show construction.
Fairbanks Co.

PLANT SITES

474—Industrial Opportunities

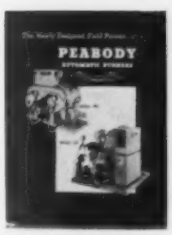
A colorful new presentation of Colorado's industrial opportunities. Included are booklets on manufacturing, power, raw materials and resources, transportation, markets and labor, Colorado living, industrial site locations, state highway map, and full color recreation booklet. Up-to-the-minute data in portfolio form.
Colorado Department of Development.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

POWER EQUIPMENT & FUELS

475—Packaged Generators

New 3-pass, low pressure, steam, or hot water package generator in 12 sizes up to 60 hp is described in bulletin 6530. For firing natural gas, light oil, or dual fuels. Features include shipment as complete package, low standby loss, no natural draft chimney required, and compact design. Cutaway and photographs.
Iron Fireman Manufacturing Co.



476—Automatic Burners

Bulletin 431 describes Peabody's newly designed, field proven automatic burners, oil, gas, or combination. Gives advantages, design, performance, and points of superiority. Components are described. Photographs of unit and control cabinet. Back cover pocket holds pages of complete specifications. Warranty explained.
Peabody Engineering Corp.

POWER EQUIPMENT & FUELS *continued*

477—Gas-Fired Boilers

Bulletin HY-F100-2 describes Hydrotherm's gas-fired, cast iron boilers in 11 sizes from 50,000 to 300,000 Btu input. Operating principles outlined and illustrated. Includes construction and operation features, capacity range, installation dimensions, weights, and applications. Photographs show types of installations.
Hydrotherm, Inc.

478—Stationary Diesel Engines

Bulletin 1101 describes Models 60 and 80 *Superior* stationary diesels. Four-cycle, 6- or 8-cylinder, in-line models, ranging from 330 to 2000 bhp and from 300 1250 kw. Typical applications are water works, sewage plants, power plants, and others. Specifications given.
White Deisel Engine Division, White Motor Co.

479—Automatic Coal Firing Units

Catalog F-520 describes Perfect Spread Stoker, a compact automatic coal firing unit capable of supplying and distributing from 50 to 7500 pounds of coal per hour. Diagrams show operation and cutaways components. Features illustrated. Typical installations diagrammed.
American Engineering Co., Div. of United Industrial Corp.

480—Waste Heat Recovery

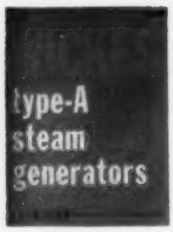
Bulletin WHB59-3 describes the economic utilization of excess heat developed from diesel exhaust gases and industrial and chemical processes. Specific industrial, marine, and chemical applications of varying capacities and services are illustrated. Advantages of bare tube and extended surface designs are noted.
Foster Wheeler Corp.

481—Industrial Water Heating System

Bulletin 923 tells how Schaub *Iso-Therm* hot water heating system eliminates over-loading and peak steam demand by modulating flow of incoming make-up water to hold constant water temperature without taxing boiler beyond average heating rate. Prevents water temperature drop. Sizes to 20,000 gph.
Fred H. Schaub Engineering Co.

482—Hot Water Boilers

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.
Combustion Engineering, Inc.



483—Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S", pendant, and drainable superheaters. Specifications are given.
Wickes Boiler Co.

484—Positive Flow Packaged Boiler

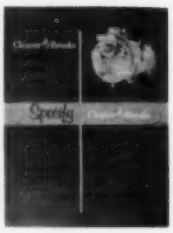
Bulletin 1275 describes Orr & Sembower's new Positive Flow Boiler. Boiler has been tested and proven by a famous consulting engineer firm. Design permits both feed injection and natural thermal circulation to augment each other thus providing maximun circulating rate and most efficient form of heat transfer.
Orr & Sembower, Inc.

485—Incinerator Stoker

Bulletin 701 presents for the first time a new reciprocating grate stoker for use in municipal and industrial incinerators. Standard modular units provide maximum flexibility of application at minimun installation cost. Ingenious design assures higher burning rates and greater efficiency, less attendant labor...
Detroit Stoker Co.

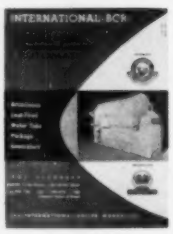
486—Packaged Steam Generators

Type CC Superior Packaged Boilers for capacities from 20 to 350 bhp are described in this 3 color catalog. Unusually compact, providing economies of installation, the Type CC has four-pass design, 5 sq ft of heating surface per bhp, and induced draft. Data and dimensions for units to burn oil, gas, or both.
Superior Combustion Industries, Inc.



487—Packaged Boilers

Catalog AD137 describes packaged boilers for heating and processing. Advantages of four-pass, forced draft, oil, gas or combination fired included. Cutaway shows construction and line drawings show operation. Complete specifications, dimensions, layout guides. Fire-tube and water tube boilers illustrated.
Cleaver-Brooks Co.



488—Coal-Fired Packaged Boilers

Bulletin 1100 describes *Coal-Pak* automatic generators developed in conjunction with Bituminous Coal Research, Inc. Features complete combustion controls, automatic coal feed and ash removal for burning low cost bituminous coal cleanly and efficiently. Complete engineering information is given.
International Boiler Works Co.

POWER EQUIPMENT & FUELS *continued*

489—Industrial-Commercial Burners

Bulletin 1 describes Industrial Combustion's *Hev-E-Oil* burners for industrial and commercial use. These burners are expressly engineered to make use of low-cost, high-heat content heavy fuel oils. Installations are pictured. Cutaway and line drawing show construction and operation. All models illustrated.

Industrial Combustion Inc.

490—Pressure Blowers

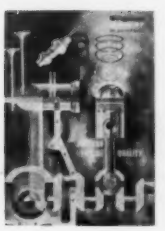
New Bulletin FI-310 provides complete factual information on Buffalo pressure blowers, Type CB and R. Job-engineered in capacities from 135 cfm to 37,500 cfm, pressures to 74″ water gauge. Special features include heat slinger, inlet butterfly valve, housing drain, cleanout door and shaft seal.

Buffalo Forge Co.

491—Packaged Air Preheater

The important points to consider in selecting a preheater for use with small boilers (25,000 to 250,000 lbs per hr) are discussed in four-page bulletin on the new package Ljugstrom air preheater. Explains how preheater saves fuel, increases boiler output and reliability, and permits use of lower grade fuels.

Air Preheater Corp.



492—Judging Engine Quality

Booklet 20185-DN935 is an informative handbook dealing with selection of engines. It emphasizes the features of various designs which provide top quality performance at minimum cost. Cutaways compare four and two cycle operation, multiple and single orifice injection valves important in engine selection.

Caterpillar Tractor Co.

493—Water Gate Hoists

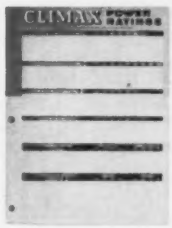
Catalog GH-353 describes gate hoists specifically designed to control water levels on hydro-electric power plant installations. Illustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.

494—Diesel Engines

Bulletin DE-6 describes Alco 251 diesels. Available in three sizes, Six, Vee 12, and Vee 16 and ratings from 550 to 2400 hp. Cutaway of Vee model shown together with illustrations and descriptions of components. Diagrams of In-line 6, Vee 12, and Vee 16 with dimensions and specifications.

Alco Products, Inc.



495—Engines

Bulletin SA-612-B, a complete listing of all Climax engines and complete power unit ratings showing maximum hp available for bare engines and recommended operating ratings for various applications of power units with accessories. Complete bulletins describing all models shown in the power chart are available.

Climax Engine Manufacturing Co.

496—Packaged Boilers

Bulletin B-3456 describes the features of the Titusville-Atlas patented wet back boiler and burner. Designed for high or low pressure, steam or hot water for heating or processing. Cutaway model shows patented wet back and line drawing shows operation. Bulletin B-3456A and B give data on 2- and 3-pass units.

Titusville Iron Works Co.

497—Condensate Drainage Control

Bulletin 6025-A describes Cochrane's C-B system of returning condensate to boilers at high pressure and high temperature. Detailed explanation is illustrated with multi-colored schematics, graphs, and photographs. Contains unit specifications, selection chart. Dimensions for standard and high differential units.

Cochrane Corp.

498—Induced Draft Bifurcator

Bulletin DB-44-56 describes DeBothezat's induced draft bifurcator, which provides instant, adequate draft eliminating costly stacks. Construction features are listed and illustrated with cutaway. Installation photographs, boiler code ratings, selection data, dimensional drawings.

DeBothezat Fans, Division of American Machine & Metals, Inc.

499—Cyclone Strainers

Bulletin S-1 describes the new Pratt cyclone strainer utilizing centrifugal force to keep larger particles from clogging basket. Unigue design allows low-cost installation, and provides for "add-on" elements for plant expansion. Furnished complete with headers for any reasonable pressure-drop. Features and construction.

Henry Pratt Co.

500—Scotch-Type Packaged Boilers

Bulletin 149A describes the new line of Kewanee forced-draft scotch packaged units including models for high pressure; for gas, oil, or gas/oil firing. Outputs range from 82 to 691 boiler horsepower. Ratings, engineering data, dimensions, standard and optional equipment. Cutaways show boiler operation.

American-Standard Industrial Division.

POWER EQUIPMENT & FUELS *continued*

501—Forced Draft Burner Systems

Specifications for 6 sizes and 7 types of the self-contained Todd *Roto-Pac* fully automatic forced draft burner systems are given in bulletin TD60-4X. Operating on gas, oil, or combination with auotmatically fired boilers or furnaces to 3,500,000 Btu/hr., *Roto-Pac* performance is summarized.

Todd Shipyards Corp., Products Div.

502—Induced Draft Fans

Bulletin L-3 describes Lehigh's line of centrifugal induced draft fans. Covers rating tables shown at 600°F, dimension data, and construction material specifications. Recommends sizes of fans for oil, gas or coal fired boilers. Includes typical installations and photographs.

Lehigh Fan & Blower Division
Fuller Company

503—Shot Cleaning System

Bulletin 2145 covers the new Diamond shot cleaning system for the most efficient and economical cleaning of such external horizontal tube surfaces as superheaters, reheaters, economizers, and air heaters. Gives advantages, principles, construction, and operation. Chart shows draft loss from ineffective cleaning.

Diamond Power Specialty Corp.

504—Turbine Steam Generators

Power plant consultants will find bulletin 03B9448, "Large Steam Turbine Generating Units", very valuable. Advanced designs from 62.5 to 600 mw are highlighted. Outdoor and nuclear-powered applications are discussed. Controls, manufacturing facilities, testing, installation, and service described.

Allis-Chalmers.

505—Tray Deaerators

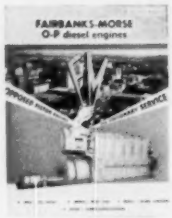
Bulletin 4732, just issued, describes Permutit tray deaerators providing highly effective protection for boilers. Advantages are listed. Principle of operation is fully explained and illustrated with cutaways. Construction data is given and accessories are listed. Also included is the Permutit tray deaerator guarantee.

Pfaudler Permutit Inc.

506—Commercial Gas Burners

Bulletin 1628 describes commercial gas burners available in capacities up to 5,100,000 Btuh input. Combinations also assembled up to 15 million Btuh. Nearly silent operation, no refractory combustion chamber, full capacity without electric power. For steel and cast iron heating and process boilers.

Iron Fireman Manufacturing Co.



507—Opposed Piston Diesel Engines

Bulletin 3800D8-S1 describes and illustrates design and construction features of Fairbanks-Morse opposed piston diesel, dual fuel, spark ignited, and turbo super charged engines for electric power generation, pump drives, marine propulsion, and other industrial and commercial uses. Cutaways show structure.

Fairbanks, Morse & Co.

508—Internal Combustion Engines

Catalog EN303 describes 4-cycle, short-stroke, air-cooled internal combustion engines manufactured by Kohler Company. Each model is illustrated. General specifications, dimensions, and various applications given. Use of engines in various types of equipment are shown in photographs. Other Kohler products.

Kohler Co.

509—Condensate Return Units

New Bulletins 900 and 910 fully describe Weinman Types ACV and ADV simplex and duplex condensate return and boiler feed units with either steel or cast iron receivers that provide trouble-free service in all types of "wet" heating systems. Drawings, charts, and selection tables are included.

Weinman Pump Manufacturing Co.

510—Steam Generators

Bulletin B-3250B describes Titusville's *Ticotherm* steam generators. Gives maximum steam output at lowest cost and in smallest space. Contains construction features, cutaway showing operation, and performance curves. Separate sheet contains boiler details and complete specifications in tabular form.

Titusville Iron Works Co.

511—Pressure Blowers

Bulletin 603 describes a complete line of direct drive pressure blowers specifically designed for the high pressure requirements of industrial combustion, cooling, conveying, and process systems. Compact, trouble-free units deliver from 100 to 8200 cfm at pressures ranging from 8 to 32 ounces psi.

New York Blower Co.

512—Automatic Burners

Bulletin 430B covers Peabody's completely re-designed automatic PK-54 burner for oil, gas, or combination. Pre-shipment tests are outlined. Includes advantages, design, components, adaptability, performance, control systems, and control cabinet arrangements. Completely illustrated. Area representatives listed.

Peabody Engineering Corp.

Consulting Engineer Directory of Advertisers' Literature --- February 1961

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POWER EQUIPMENT & FUELS *continued*

513—Hot Water Heating Boilers

Bulletin HY-F107 describes Hydrotherm's gas-fired hot water heating plants, for heavy duty space heating and large volume hot water supply, 360,000 to 3,600,000 Btu input. Contains construction and installation information. Includes load distribution figure, efficiency graph, and capacity charts. Specifications.

Hydrotherm, Inc.

514—Engine and Generator Sets

Complete catalog includes power curves, sectional drawings, and subassembly photographs of six basic engines in 19 models, a power range of 100 to 2150 bhp. Diesel, gas, and dual fuel engines and generator sets 150 to 1250 kw. are available as a custom installation.

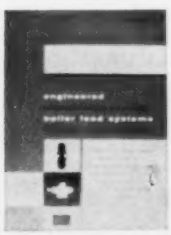
White Diesel Engine Division, White Motor Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

515—Coal-Fired Packaged Boilers

Bulletin PG-59-4 describes semi-automatic stoker-fired packaged boilers now available in standard sizes of 43,000, 50,000 and 63,000 lb of steam per hour. Performance characteristics are given in graph and table form. Photographs and line drawings of the water-tube units show installation and construction details.

Foster Wheeler Corp.



516—Boiler Feed Systems

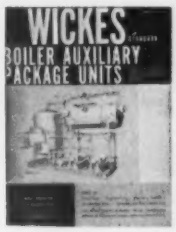
New Catalog 55-D contains revised specification and application data on standard and special design boiler feed systems from Schaub Engineering Co. Pumps furnished with *Dura-Hard* electrolized impellers for double service life. High pressure boiler feed systems include rugged power plant pump line.

Fred H. Schaub Engineering Co.

517—Boiler Case Histories

Cleaver-Brooks news bulletins, published monthly by the Cleaver-Brooks Company, are offered. These include pictorial reports on case histories, showing various ways Cleaver-Brooks boilers are used. The four-page bulletins are profusely illustrated. Includes testimonials on space saving and lower overhead.

Cleaver-Brooks Co.



518—Boiler Auxiliary Packaged Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wickes Boiler Co.

519—Vibra-Grate Stokers

Catalog S-546-A describes water-cooled, vibra-grate stoker, outlining five major advantages. Stoker fires large or small boiler economically and efficiently. Operating principle outlined and construction features illustrated. Included are 16 diagrams of actual installations.

American Engineering Co., Div. of United Industrial Corp.

520—Spreader Stokers

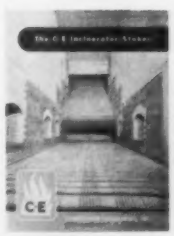
New bulletin 860 illustrates and describes the Detroit *RotoStoker*, a spreader stoker with overthrow rotor feeders. For use with medium size boilers up to about 60,000 pounds of steam per hour capacity. Power dumping, hand dumping, or stationary grates. May be installed in almost any type boiler.

Detroit Stoker Co.

521—Water-Tube Packaged Boilers

Superior Type D completely packaged watertube boilers for capacities from 11,000 to 61,000 lbs of steam per hour are described in this illustrated catalog. Burning gas, oil, or both, Type D Superior packaged boilers are completely coordinated units, factory-assembled, tested, backed by undivided responsibility.

Superior Combustion Industries Inc.



522—Incinerator Stocker

The Combustion Engineering incinerator stoker is completely described in Catalog IS-1. Various schematic drawings of several designs of units are featured. Firing methods, performance records and the many advantages of incineration are covered in detail. Closeup photographs show grate surface design.

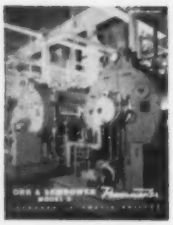
Combustion Engineering, Inc.

523—High Temp Water Generators

High temperature water generators for single and multi-story buildings are described in bulletin 1900 on International-LaMont *Thermojet* Generators. Bulletin explains LaMont principle of forced recirculation which permits temperature differentials to 200°F, with no thermal shock. Compact construction.

International Boiler Works Co.

POWER EQUIPMENT & FUELS *continued*



524—Oil and/or Gas-Fired Boilers

Bulletin 1260 describes and illustrates *Powermaster* Model 3 line. Includes gas, oil, and combination gas/oil models, a new specially designed hot water boiler, and the new steam atomizing principle for use with No. 6 oil. Ratings and dimensions of all sizes in line are included. Cutaway shows operation.

Orr & Sembower, Inc.

525—Municipal Engines

Bulletin SA-631 describes the complete line of Climax engines built for municipal plant service. These engines, from six to twelve cylinders and from 60 to 600 hp, are available for all sewage and water treatment plant applications. Climax engines are noted for simple, rugged construction and smooth operation.

Climax Engine Manufacturing Co.

526—Automatic Boiler-Burner Plant

Bulletin 4 describes the simplicity, easy maintenance, adaptability, and guaranteed field performance of the Highlander, two-pass, Scotch type boiler-burner plant. A general description is illustrated in line drawings to show construction and operation. Data for each model shown in tabular form.

Industrial Combustion Inc.

527—Packaged Steam Generators

Bulletin B-3255 describes Titusville's Type WTP packaged steam generators with steam capacities from 10,000 lbs to 60,000 lbs per hour. Construction, performance, and maintenance are discussed. Outstanding features given. Bulletin B-3255-A includes line drawings and specifications on various sizes.

Titusville Iron Works Co.

PUMPS & COMPRESSORS

528—Screw Type Pumps

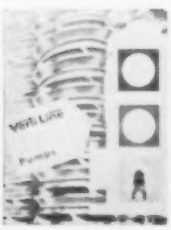
Bulletin 3200 describes De Laval's IMO pumps, pressures to 3000 psi and capacities from 1 gpm to 4000 gpm. Cutaways show construction and operation of single end and double end pumps. Includes advantages, application illustrations, viscosity conversion tables, horsepower and capacity graphs. Performance data.

De Laval Steam Turbine Co.

529—Submersible Water Pumps

Bulletin B1300 describes Sumo's industrial size submersible water pumps from 3 through 125 hp at 3550 and 1750 rpm. Heavy duty pumps used for municipal water supply and booster systems, industrial and commercial buildings, institutions, and irrigation. Features are pointed out in cutaway photograph.

Sumo Pumps, Inc.



530—Close-Coupled Industrial Pumps

Bulletin 1100 describes Layne & Bowler's *Verti-Line* close-coupled industrial pumps. Capacities from 20 gpm to 30,000 gpm, heads to 600 psi. Features illustrated and described. Line drawing shows components, and cutaway shows construction. Head-capacity range table, material specifications, and photographs.

Layne & Bowler Pump Co.

531—Rotary Positive Blowers

Series 400 and 600 rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S-65D, including dimension drawings and cutaways. Volumes up to 20,000 cfm single stage with pressures to 10 psi or vacuums to 20 in Hg. Features anti-friction bearings and wide-face herringbone timing gears.

Sutorbilt Corp.

532—Nuclear Pumps

Four page bulletin describes BJ pumps for radioactive nuclear fluids. Three basic types, liquid metal, liner motor, and mechanically-sealed are shown with typical configurations, specifications and photographs. Quality control and manufacturing techniques are described.

Byron Jackson Pumps, Inc.
Subsidary of Borg-Warner Corp.

533—Rotary Compressors

Bulletin ACO-100 gives complete description and engineering details on new Fairbanks-Morse rotary positive displacement compressors, 6 frames sizes, 27 models available covering capacities 1000 cfm to 20,000 cfm. Ideal for process applications and other industrial uses. Cutaway shows construction.

Fairbanks, Morse & Co.

PUMPS & COMPRESSORS *continued*

534—Rotary Pumps

Catalog 958B contains detailed illustrations of several models in each of the five major series of Roper heavy-duty industrial pumps. Capacities, dimensions, performance and application data, and illustrated major features for each series are supplied. Roper custom pumps and pump-motors are also featured.
Roper Hydraulics, Inc.

535—Jacketed Pumps

Catalog "E" describes the complete line of jacketed pumps for maintaining uniform temperature, hot or cold, on thin or viscous liquids. Capacities from 90 to 450 gpm are illustrated. Catalog includes complete dimensional data with line drawings, pump specifications, and performance graphs. Pumps are illustrated.
Viking Pump Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

536—Circulating Pumps

Bulletin 1470.5 gives features, specifications and performance curves of Type CSL centrifugal pumps designed for use where quietness is a must. Motor and pump are sleeve bearing and oil lubricated. Capacities to 1000 gallons per minute, heads to 95 feet. Available with steel or cast iron base. Specifications.
Pacific Pumping Co.

537—Split Case Centrifugal Pumps

Bulletin 106-V describes Type AJV Vertical Base Mounted Split Case Pumps manufactured by Aurora Pump Division. Capacities range to 1400 gpm and heads to 425 feet. Includes features and typical applications. Line drawing is keyed to parts list. Complete specifications.
Aurora Pump Division
New York Air Brake Co.

538—Jet Apparatus

Bulletin J-1 describes the various kinds of jet apparatus manufactured by Schutte & Koerting for syphons, eductors, heaters, blowers, exhausters, compressors, scrubbers, condensers, pumps, and other types of equipment. Each application explained with cutaway drawings showing operation. Gives details.
Schutte & Koerting Co.

539—Single Suction Pumps

Bulletin 976-G gives you complete specifications on full ball bearing single suction pumps. Use includes handling saturated refrigerants and saturated liquids in air conditioning, viscous fluids in petrochemical and process industries, corrosive liquids, general water supply, and many others.
Buffalo Forge Co.

540—Compressed Air Filters

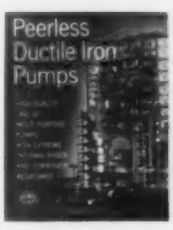
Catalog 6000 covers compressed air filters of 20 to 200 scfm capacity that remove all harmful traces of dirt, water and oil down to 2 microns or less, go months without maintenance. Describes new, exclusive scrub-and-polish action with cleaning-by-coalescence. Lists models for all needs, ¼" to 2" pipe size.
King Engineering Corp.

541—Cooling Tower Pumps

Bulletin CT-360 describes Bell & Gossett cooling tower pumps and piping. This manual outlines the six steps that must be taken in the selection of pump and pipe in any cooling tower installation. Illustrated with schematics and charts. Contains selection charts, design tables, charts, typical installation.
Bell & Gossett Co.

542—Immersible Non-Clog Pumps

Bulletin 1710 furnishes complete information on installation, operation, and capabilities of Weinman Type M immersible non-clog pumps for maintenance-free handling of sewage, drainage water and industrial wastes. Bulletin includes drawings, selection table, and descriptions of accessories for models.
Weinman Pump Manufacturing Co.



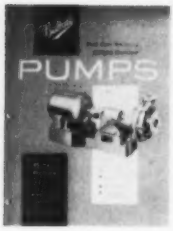
543—Single and Multi-Stage Pumps

Bulletin B-1314 describes single and multi-stage pumps with resistance to thermal shock and corrosion. Single stage Type A pump, sizes of 4" and larger, capacities to 60,000 gpm, heads to 400 ft Multi-stage Type TU and TUT, heads to 1500 ft, capacities of 3000 gpm.
Peerless Pump, Hydrodynamics Division
Food Machinery & Chemical Corp.

544—Centrifugal Air Compressors

Bulletin 4000-B1 describes Worthington's 4-stage, integral gear, centrifugal air compressors. Air inlet capacities from 4000 to 30,000 cfm, discharge pressures from 60 psig to 105 psig. Cutaway shows construction. The ten advantages of this compressor are described and illustrated. Various types of installations pictured.
Worthington Corp.

PUMPS & COMPRESSORS *continued*



545—Close-Coupled Pumps

Bulletin 975-F gives you complete information relative to mechanical and hydraulic features of close-coupled pumps. Suitable for most pumping situations and especially desirable in limited space. Parts interchangeability permit low inventory. Application data included in bulletin. Rating tables simplify selection.

Buffalo Forge Co.

546—Centrifugal Pipeline Compressors

Bulletin 503A describes De Laval's centrifugal compressors. Includes advantages, power requirement graphs, impeller designs, and on-the-job photographs of De Laval's compressors. Cut-aways show complete compressor construction and design features of barrel. Colored schematic shows contact shaft seal.

De Laval Steam Turbine Co.

547—Non-Leaking Vertical Pump

Bulletin describes Johnston *Liqui-Seal, Unit-Line* pump, designed to pump all types of liquids. Pump has no mechanical seal or packing box but creates seal hydraulically by unique system of controlled leakage below base plate. Originally developed to handle corrosive and abrasive acids. Pump now widely used.

Johnston Pump Co.

548—Manual of Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering data.

Roper Hydraulics, Inc.

549—ADAPT-*ABLE* Pumps

Bulletin APEB 250.12 describes Fairbanks-Morse ADAPT-*ABLE* pumps, which give a wide range of clear water, non-clog, and other liquid handling modifications. Pump frame dimensions align with NEMA motor frame dimensions for ease of mounting and trouble-free operatino. Various type illustrated.

Fairbanks, Morse & Co.

550—Vertical Volatile Fluids Pump

Bulletin 1026 details many variations possible when these versatile turbines are used to pump volatile fluids. Mechanical and hydraulic features, efficiency factors, available suction head requirements, and data on typical uses, including direct dispensing, line and wet pit booster, process transfer.

Johnston Pump Co.

551—Pumps and General Services

Bulletin 100, condensed list of services pertaining to water well systems, pumps, drilling, allied services, and equipment. Includes water wells, oil and water lubricated vertical turbine pumps, well screens, special pumps for many uses, irrigation, special drilling, water treatment, and service work.

Layne & Bowler, Inc.

552—Pumps and Blowers

California series rotary positive, gas pumps and vacuum pumps are described in bulletin S-59H with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Many features detailed.

Sutorbilt Corp.
Subsidiary of Fuller Co.

553—Submersible Pumps

Bulletin B-259 describes the new design of the Super-Sumo submersible pump for 4" and larger wells. Designed for economy installations, the pump features bronze and stainless steel construction for corrosion resistance, long life, and maximum pumping capacity. Sizes from 1/3 hp to 1½ hp, capacities to 1700 gph.

Sumo Pumps, Inc.

554—Vertical Turbine Pumps

Bulletin 900 completely describes the facilities of the Layne & Bowler Pump Co. The *Verti-Line* pump made today represents 50 years devoted to the design, engineering, production, and improvement of vertical turbine pumps. Typical fields where *Verti-Line* pumps are in service shown. Types of pumps pictured.

Layne & Bowler Pump Co.

555—Sumpmaster Pumps

Bulletin 2-150 reports the design features and capacities of a complete line of sump pumps, the *Sumpmaster*. Supplemental sheet provides helpful engineering information on sump application and proper pit design for maximum efficiency. Operation illustrated.

Byron Jackson Pumps, Inc.
Subsidary of Borg-Warner Corp.

556—Rotary Pump Engineering Manual

Catalog "K" is a 36-page engineering manual on rotary pumps including six pages on rotary pump fundamentals. Sixteen pages of data on the selection of the correct pump for your application and fourteen pages of useful engineering information included. The catalog contains line drawings, graphs, and charts.

Viking Pump Co.

SPECIAL SERVICES FOR ENGINEERS

557—Equipment Handbook

Bulletin describes a new book, Mechanical-Electrical Equipment Handbook. Contains sections on Heating and Ventilating, Plumbing, Sewage Disposal, Kitchen and Cafeteria Equipment, Illumination and Electrical Wiring, and Ready Reference Material. Includes main points covered by the author.

John Wiley & Sons, Inc.

558—Installation Thru Start-Up

Bulletin 107 illustrates and describes complete PSC installation thru start-up service for the automation, systems and instrumentation fields, including installation drawings, installing instruments, setting panels, running electrical and tubing leads, commissioning, operator orientation and supplementary personnel.

Panellit Service Corp.

STRUCTURAL MATERIALS & EQUIPMENT

559—Asbestos-Cement Roofing Tile

Illustrated 4-page folder BM-243 describes *Promenade* asbestos-cement roofing tile and lists typical applications of this product. The tiles protect asphalt roofs, permit optimum utilization of space, provide fire-resistance for roof structures, Coving tile, flat tile, and eaves piece are illustrated. Sizes and weights.

Keasbey & Mattison Co.

562—Wire Rope Catalog

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.

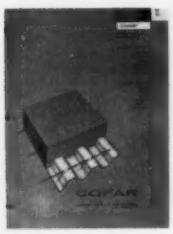
American Steel & Wire Division, United States Steel Corp.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

563—Prestressed Concrete Members

The rapid growth in the use of precast pretensioned bonded prestressed concrete members confirms their several advantages over competitive materials. Bulletin PC-945 describes application and productions, and covers buildings, bridges, piles, casting bed details, and tensioning data. Fully illustrated.

John A. Roebling's Sons Division.



560—Concrete Form and Reinforcement

Catalog BC-601 describes and illustrates *Cofar*, a deep-corrugated, high-strength galvanized steel sheet with T-wires welded to each corrugation. *Cofar* is form for wet concrete and replaces conventional positive and temperature reinforcing. Contains details, design principles, and selection tables.

Granco Steel Products Co.

564—Winter Protection for Concrete

Bulletin 2400 describes Horn *No-Freeze*, the multi-purpose admixture which provides winter protection for concrete and mortar. Gives functions, laboratory reports, methods of application, and packaging. Includes data on proportions at temperatures from 15° F to 49° F.

A. C. Horn Companies, Div. Sun Chemical Corp.

561—Composite Building Construction

Bulletin describes composite construction. This is simply an improvement of the commonly used concrete slab and steel beam type construction. Gives history, advantages, compares new and old construction, records project saving 20 to 25 percent in structural steel.

Nelson Stud Welding Division, Gregory Industries, Inc.

565—Chord Steel Joists

New 52-page bulletin contains complete data on Laclede straight chord steel joists, "S" and "L" Series. The bulletin includes numerous photographs, drawings and charts, plus such detailed information as design and construction features, dimensions and specifications, load and spacing tables, installation data.

Laclede Steel Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

566—All-Purpose Flooring Panels

Catalog 270 describes *Celluflor,* the new panel which serves as both structural sub-floor and cellular raceway for infloor electrification, communication, or heating systems. Includes load tables, section properties, construction and installation details, and specifications. Typical applications pictured.
Inland Steel Products Co.

567—Service Fittings

Bulletin 493 illustrates design features, simplicity of assembly of new *Spang* service fittings, suitable for use with underfloor distribution systems of any manufacturer. Covers individual power and phone fittings and includes illustrations of linoleum, pan, terrazzo holder, plus part numbers, and ordering information.
National Supply Co.

568—Multigrip Floor Plate

Bulletin ADUCO-17001-60 describes USS Multigrip floor plate. It is easy to clean and provides positive traction. Full size illustration shows design and gives dimensions. Multigrip features are explained and illustrated. Tables give dimensions, weights, and allowable uniform loads. Installations are pictured.
United States Steel Corp.

569—Rolling Door Motor Operator

Bulletin 111 is a complete catalog on new power operator for motor operation of metal rolling doors manufactured by Kinnear. Includes complete specifications, dimensional data and outlines the advantages of power operation for heavy doors. Describes line of accessories and types of operating controls.
Kinnear Manufacturing Co.

570—Seals and Gaskets

Four-page bulletin SG-661 covering complete line of *Weathertite* seals for various types of control joints in block constructed walls. It also covers masonry gaskets of nonabsorbent elastomer for use between sill and coping stones, brick or stone wall panels, and masonry and structural steel members.
Williams Equipment & Supply Co.

571—Large Hot-Pressed Nuts

Bulletin 459 contains prices, weights, keg quantities, dimensions of American standard heavy large hot-pressed nuts hexagon and square used in heavy construction for buildings, bridges, towers, all types of big construction jobs. Size 1⅛ in. thru 4 in. bolt diameter. Steel and engineering specifications.
Jos. Dyson & Sons, Inc.

572—Aluminum Windows

Catalog A-61 describes the complete line of Bayley aluminum windows, including original Bayley features. The booklet includes such items as projected windows, pivoted windows, class room windows, ribbon windows, and detention windows. Dimensions, construction, design, fasteners, materials, and finish.
William Bayley Co.

573—Dendable Asbestos-Cement Sheet

Bulletin BM-231 describes "K&M" *Kamwall,* the first flexible and fireproof asbestos-cement structural sheet. "K&M" *Kamwall* can be stapled or nailed without pre-drilling, cut with an ordinary saw. The bulletin covers the features and suggested uses of "K&M" *Kamwall,* plus its physical properties.
Keasbey & Mattison Co.

574—New Ties for Masonry Walls

A new technical catalog features new adjustable anchors and ties for bonding non-modular masonry veneer to modular masonry backing. Also featured are nail-on anchors for anchoring masonry veneer to existing surfaces. Engineering drawings illustrate products use, and specifications describe application. Dimensions.
AA Wire Products Co.

575—Fire-Retardant Ceilings

Brochure AD-99-1160 describes in detail Armstrong's new Acoustical Fire Guard lay-in ceiling system. The features of this UL-Approved ceiling are outlined. Installation procedures are pictured and described. Accessibility to hidden pipes conduit, ducts, and electrical equipment shown. Specifications and patterns.
Armstrong Cork Co.

576—Concrete Anchoring Systems

File Folder F-259P contains literature describing features and applications of the Phillips Red Head self-drilling concrete anchor system. Graphically presents mode of installation and character of anchorage. Includes specifications, capacity ratings, test laboratory reports, fact sheets, and catalog.
Phillips Drill Co.

577—Steel Roof Deck

Bulletin IR-89 describes the new USG Steel Roof Deck. Advantages such as economy, adaptability, insulation support, appearance, ease of maintenance, fire resistance are pointed out. Various accessories are listed. Technical data on safe total loads and properties on types of spans. Placing and welding.
United States Gypsum.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

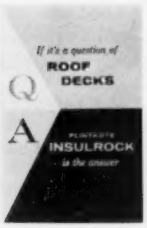
578—Steel Deck

Catalog D-60 covering four steel deck sections, produced in a 24 in. and 12 in. module. Includes description, section property tables and load tables in bending and deflection, specifications, construction details, and other information on steel deck used as curtain walls, partitions, and permanent floor forms.
R. C. Mahon Co.

579—Sprayed Asbestos Coatings

Sprayed *Limpet* asbestos for fire protection, and acoustical and moisture control, is described in detail in a 4-page folder. The folder provides a list of approved fire-resistance ratings for the product, and lists complete specifications. Pictured are buildings in which this product is used.
Keasbey & Mattison Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

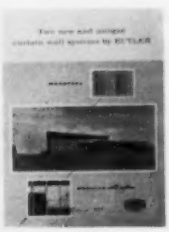


580—Roof Decks

Booklet issued by The Flintkote Company, *Insulrock* Division, asks and answers 20 questions regarding *Insulrock*. What it is, how it is used, how it is applied, where it can be used, and many other pertinent questions are answered. Contains photographs of installation procedure and many applications.
Flintkote Co., Insulrock Division.

581—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.
Borden Metal Products Co.



582—Curtain Wall Systems

Bulletin 1951 describes Butler's two new insulated curtain wall systems, *Monopanl* and *Modular*, for use with commercial, industrial, and community buildings. Contains diagrams of construction and photographs showing installation procedures. Weight tables and span tables as well as application photographs.
Butler Manufacturing Co.

583—Curtain Wall Construction

Bulletin RVW 3-60 is a complete file kit with two pockets containing full information on both the *Bold-Line* and *Thin-Line* versatile wall systems. Described is the method of obtaining custom design versatility while using standard grids, panels, and sash. Includes reproducible scale details of components.
H. H. Robertson Co.

584—Aluminum Grating

New six-page illustrated bulletin describes the basic advantages of Gary Super *Galok* Aluminum Grating. Outlines its industrial uses for stair treads and other uses decorative and functional. Included are easy-to-use tables of safe loads and weights, panel widths, types
Rockwell-Standard Corp., Grating Division.

585—Pre-Engineered Steel Buildings

Bulletin 60-1-257 presents Stran-Steel's new concept in pre-engineered steel buildings combining the finest in design with mass production economies. Full color illustrations show Stran styles and typical interiors. The many colors available are shown in color chart. Special features are described and illustrated.
Stran-Steel Corp.

586—Use of Curtain Wall

Publication ADUCO 91031-60 is a quarterly publication for the men who sell building products. Discusses in detail the use of curtain wall in USS Vitrenamel and stainless steel sheets. Full color illustrations show actual installations. Color chart shows colors available in Vitrenamel. Method of testing shown.
United States Steel Corp.

587—Fluted Steel Foundation Piles

Catalog No. 91, 24 pages, contains information on physical properties and design features, standard weights and volumes of Monotube fluted, steel foundation piles. Included are photos of typical installations, test driving data, and other technical data of particular interest to consulting engineers.
Union Metal Manufacturing Co.

588—Tru-Weld Grating and Treads

Bulletin 1112, 12 pages, describes the characteristics of a new-type of steel industrial floor grating called *Tru-Weld*. Design, panel widths, and load tables for both the grating and treads, standard and close space, are detailed, along with specifications necessary for ordering. Applications are illustrated.
Dravo Corp.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

589—Welded Steel Grating

Bulletin KSG-1-6-60 describes Kerrigan's *Weldforged* steel grating and treads. A concise, factual catalog. New arrangement of standard, close spaced, and tread data. Types for special applications located quickly. Complete tables on safe loads and weights. Specifying instructions. Installation photographs.
Kerrigan Iron Works Co.

590—Colored Glass Blocks

Bulletin GB-115 gives data on design flexibility and structural advantage of glass block and sculptured glass module. Available colors shown. Light transmission, insulation value, physical performance, and proper selection. Installation procedure outlined, application specifications, and accessories included.
Pittsburgh Corning Corp.

591—Multigrip Floor Plate

Bulletin ADUCO-17002-59 describes USS *Multigrip* designed for safety, comfort, and economy. The advantages are completely outlined and fully illustrated. Actual installations are shown. Full size illustration shows pattern and gives complete dimensions. Drawing shows thickness of plate. Uniform load tables.
United States Steel Corp.

592—110-Ton Crawler Crane

Catalog 790-CG-1 describes the all-new, big capacity American 900 Series crane and 4⅝ yard excavator. The many exclusive features of this crane for handling heavy materials, are listed. Various components are completely described and illustrated. Actual on-the-job photographs show capacity of crane.
American Hoist & Derrick Co.

593—Column Fibre Forms

Bulletin 104-A describes *Sonotube* Fibre Forms, manufactured by Sonoco Products Company, which provides the fastest and most economical means of forming round columns of concrete. Offered in sizes from 6 in. to 48 in. Includes complete technical data and full installation instructions. Use illustrated.
Sonoco Products Co.

594—Metal Partitioning

Catalog 6015 gives full installation instructions for erecting metal partition panels in plants, using the *Quick-Erect* patented clips. Cut-away drawings for enclosing tool rooms, store rooms, separations, window guards, folding gates (Bostwick and Lazy Tong Types), and bins. Photographs of actual installations.
Globe Co., Products Division.

595—Channel and Fittings

Globe channel catalog describes a superior system of channel framing; for every purpose; for greater strength; completely reusable. Fully illustrated showing beam load data, standard and extra strong weight pipe data, column loads, conduit tubing data, and complete instructions for installing. Illustrated.
Globe Co., Products Division.

596—Cellular Glass Accoustic

Bulletin GC-3 contains theory behind *Geocoustic* cellular glass acoustical material, its composition, ability to absorb and diffuse sound, and practicability of "patch" technique. Actual job photographs along with line drawings showing design possibilities. Data on size and availability of material.
Pittsburgh Corning Corp.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

597—Pressure Grouting Services

Brochure PGS-0002 describes Halliburton Pressure Grouting Services including equipment, personnel, and materials for any siz gerouting job, a dependable and convenient method of metering, mixing, placing grouting materials continuously. Selection of special chemical grouting fluids and cement grout slurries.
Halliburton Oil Well Cementing Co.

598—Cable and Tubing Support Systems

Chalfant Support system utilized for carrying instrumentation tubing, process tubing, piping, and control cables. Recommended for more economical, and faster installation over previous type systems. Completely pre-engineered and available with all accessories. Aluminum, galvanized steel and aluminized steel.
Chalfant Products Co.

599—Steel Roof Decks

Bulletin WC-241 outlines 21 important advantages of Wheeling's two new styles of roof decks, narrow and wide rib. Load tables, suggested specifications, and other technical data included. Bonderized *Super-Rib* decks are roller painted, then supplied in unlimited lengths, 2'-0" widths. Used also for wall panels.
Wheeling Corrugating Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

600—Spring Assisted Doors

Scale detailed drawings of horizontally hinged *spring-assisted* doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, floor doors, pit doors, and basement doors with steel stair stringers. Specifications, standard sizes, and weights included. Sales offices in this country and Canada listed.

BILCO Co.

601—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, non-slip footing, according to four-page bulletin HTP2130. This brochure describes such features as *A. W. Algrip* nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

602—Electric-Welded Steel Tubing

This four-page file folder is printed in two colors and gives sizes, weights, and uses of Wheatland Electric-Welded Steel Tubing. Also check list of ordering information. Covers hot- and cold-rolled mechancial tubing, pre-dipped and hot-dipped galvanized. Illustrated and printed on heavy durable stock.

Wheatland Tube Co.

603—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

604—Glass Protected Smokestacks

Bulletin SS-210 contains facts on glass-protected smokestacks pertaining to special applications, operating temperature ranges, assembly and errection procedures. Also comparative maintenance figures against steel stacks. Installation photographs, special sections, and accessories. Shipping weights and sizes.

A. O. Smith Corp.

605—Metal Gratings and Treads

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, press-locked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, economical industrial and power plant flooring and stairways.

Irving Subway Grating Co., Inc.

606—Asbestos-Cement Materials

Briefed specifications and descriptions of a complete line of asbestos-cement building materials given in an illustrated 4-page folder. Line includes roof decking, corrugated asbestos for roofing and siding, flat roofing tile, colored decorative sheets in various patterns, flat sheets, shingles, and air duct.

Keasbey & Mattison Co.

607—Open Web Steel Joists

The Steel Joist Institute's standard specifications and load tables, 1960 Edition, provides complete information on the advantages, design, application, and characteristics of open web steel joists, both the "S" Series and the "L" Series. The 36-page booklet includes numerous drawings, charts, and tables.

Steel Joist Institute

608—Masonry Wall Reinforcement

Bulletin by Dur-O-waL describes wall reinforcement and *Rapid Control Joints*. Includes advantages, description, physical properties, section table, and general specifications for solid masonry wall construction. Line drawings show application. Drawings and specifications on both types of *Rapid Control Joints*.

Dur-O-waL.

609—Acid Proof Cement

Bulletin 31 describes acid proof cement for chimneys, floors, incinerators, pits, sewers, and tanks. Advantages and technical information given. Method of mixing, application, quantities required, and general specifications are included. Photographs show application methods and industries using this cement.

Sauereisen Cements Co.

610—Vinyl-Coated Corrugated Steel

Catalog V-91 describes a new vinyl protected corrugated steel — Granco *Vin-Cor*. Used in industrial and commercial buildings of all types. Available in nine standard colors and a wide selection of gages and patterns. Full color catalog gives color selection, section properties, typical details, and specifications.

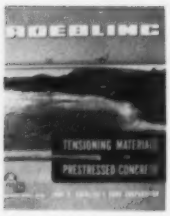
Granco Steel Products Co.

611—Steel Tubing for Structural Use

Folder STR-60 introduces steel tubing for use as columns, beams, and other structural applications. Contains information on method of manufacture, types available, application photographs, and advantages. Complete size range of round, square, and rectangular shapes is included. Elements of sections shown.

Republic Steel, Steel & Tubes Division.

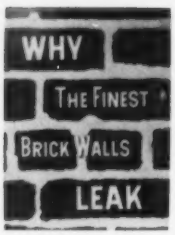
STRUCTURAL MATERIALS & EQUIPMENT *continued*



612—Concrete Tensioning Materials

Catalog PC-936 shows sizes, weights, strengths, and typical load-elongation curve of uncoated stress-relieved strand for pretensioned bonded prestressed concrete. Properties of galvanized strand and uncoated stress-relieved wire for post-tensioned design are listed. End fittings, bearing plates are illustrated.

John A. Roebling's Sons Corp.



613—Why the Finest Brick Walls Leak

Bulletin fully explains and illustrates why even the finest brick walls leak. The corrective factors, measures to be taken, and Horn *Hydratite Plus*, the water repellent admixture for mortar, are fully described, together with its functions and methods of application.

A. C. Horn Companies,
Div. Sun Chemical Corp.

614—Steel Roof Systems

A completely new manual, Catalog 248 describes Inland's ten separate roof systems which offer the designer a choice of steel or poured construction. Included are comparison and selection charts, details, load tables, section properties, methods, specifications and other data on Inland roof systems.

Inland Steel Products Co.

615—Masonry Reinforcements

AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1961 Sweet's brochure is now available. This new brochure features design drawings, photographs of actual installations, and suggested guide specifications. Line drawings show various applications.

AA Wire Products Co.

616—Metal Rolling Doors

Bulletin 104, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings, mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

617—Acoustical Ceiling Panels

Four-page illustrated folder BM-239 gives details on various styles of acoustical ceiling tiles. Reduce room noise as much as 75%. Folder lists colors available and presents easy-to-follow instructions for installation. Shows K & M wall plank as well as various patterns of ceiling tile.

Keasbey & Mattison Co.

618—Steel Welding Equipment

The consulting engineer's file folder contains literature describing the use of Nelson stud welding equipment for concrete anchoring devices and other structural fasteners. Includes data on welded stud fasteners, concrete fasteners, and powder actuated fasteners. Illustrated.

Nelson Stud Welding Division,
Gregory Industries, Inc.

619—Prestressed Concrete

New 12-page bulletin describes the productions, application, and characteristics of Laclede 7-wire strand prestressed concrete. Numerous photographs and text illustrate the entire manufacturing operation. Bulletin also includes typical load elongation curves on ⅜" and 7/16" diameter strand, A.S.T.M. specifications.

Laclede Steel Co.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

620—Underfloor Distribution Systems

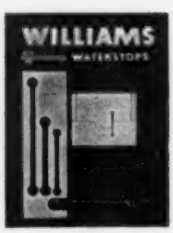
Bulletin 513 contains drawings, part numbers, and photographs of the three *Spang* duct systems for power, telephone, and intercom. Underfloor duct (for regular slab construction), headerduct (for cellular floors), and industrial duct (large capacity for heavy requirements in phone and intercom systems). Fittings described.

National Supply Co.

621—Walls of Steel

Bulletin ADUCO 91038-60 describes a new kind of stainless steel curtain wall fabrication used on the Harris Bank Building in Chicago. Bulletin opens up to 22 x 34. Gives suggested guide specifications for the architectural metalwork. Includes isometric of erection of complete panel unit and sealing joint.

United States Steel Corp.



622—Waterstops

Four-page bulletin WS-61 covering complete line of rubber, vinyl, and neoprene waterstops with molded accessories such as unions, ells, tees, and crosses — both flat and vertical. Includes properties and characteristics, recommendations for use, methods of installing in formwork, and suggested specifications.

Williams Equipment & Supply Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

623—Concrete Anchoring Systems

Bulletin F-200 describes Phillips Red Head concrete anchor system, the safest, surest way to anchor in concrete quickly. These self-drilling concrete anchors are available in all types and sizes. Each type is illustrated. Specifications in tabular form. Line drawings show installation procedures. Accessory tools shown.
Phillips Drill Co.

624—Heavy Construction Fasteners

Bulletin 160 covers large fasteners for the heavy construction and machinery industries. Large forged standard and special purpose nuts, bolts, threaded rods, loop rods, eye bars, construction accessories, size 1¾ in. thru 12 in. bolt diameter. Illustrated with photographs of standard and special large fasteners.
Jos. Dyson & Sons, Inc.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

628—Acoustone Patterned Ceilings

Catalog describes horizontally hinged *spring-assisted* access doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, flush floor doors, sidewalk doors, basement doors. Specification outlines materials, prices, and weights. Line drawings show operation. Sales offices listed.
BILCO Co.,

629—Rolling Steel Doors

New eight-page illustrated bulletin describes Gary welded steel grating and treads. Has easy-to-use table of safe loads, weights and symbols, and panel widths. Included is data on fastening devices illustrated by drawings. Information on specifying grating and tread.
Rockwell-Standard Corp., Grating Division.

630—Insulrock Roof Decks

Bulletin describes Stran-Steel's complete lightweight steel system with fully integrated cold formed structural sections. Contains information on joists, studs, channels, columns, beams, rigid frames, zee sections roof deck, ribbed decking, and curtain wall. Includes patterns, dimensions, and properties.
Stran-Steel Corp.

625—Doors for Special Services

Bulletin SC-232 describes United States Gypsum's *Acoustone* patterns for ceilings sculptured in mineral tile. Illustrations show various patterns. Contains information on sizes, light reflection, methods of installation, colors, washability, paintability, and resistance to soiling. Gives sound absorption coefficients.
United States Gypsum.

626—Welded Steel Grating

Hand operated, mechanically operated, and power operated Underwriters' labeled and non-labeled rolling steel doors, grilles, and shutters to meet every door requirement are described and illustrated in 16-page catalog G59. Complete specifications are given for each type with drawings, dimensions.
R. C. Mahon Co.

627—Complete Structural Systems

Catalog describes Flintkote's *Insulrock* roof decks. Lists the advantages in its use. Gives design data, specifications, and erection procedures with detailed drawings on joist and beam construction and sub-purlin construction. Also gives data on roof deck formboard and formboard for concrete construction.
Flintkote Co., Insulrock Division.

631—Electric and Air Subfloor

Catalog Q-54-60 describes the function, installation, and advantages of H. H. Robertson's *Q-Air Floor*, cellular-steel subflooring with raceways for heating and cooling as well as wiring. Construction details are included and details of accessories. Also contained are load and property tables and specifications.
H. H. Robertson Co.

632—Floor Gratings

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.
Borden Metal Products Co.

633—Acoustical Fire Guard Ceiling

Bulletin AD-100 describes Armstrong's Acoustical Fire Guard, the first time-design-rated acoustical ceiling. Features inexpensive fire protection, economical installation, accessibility, and design. Also includes sound attenuation factors, sound-absorption coefficients, and technical data. Construction drawings.
Armstrong Cork Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

634—Resin Cement

Bulletin 40 describes resin cement, acid and alkali proof, for floors, tanks, pits, chimneys, digestors, and sewers. Application methods, complete directions, quantities required per 1000 brick, setting time, and physical properties are given. Recommended construction procedures for acid and alkali resistant floors.
Sauereisen Cements Co.

635—Curtain Wall Systems

Catalog C-61 outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement.
William Bayley Co.

WASTE DISPOSAL EQUIPMENT

636—Packaged Sewage Pump Stations

Bulletin PS-60 describes the Tex-Vit packaged sewage pump station. Available in 50 to 2,000 gpm capacities, these are duplex units complete with motors, pumps, controls, dehumidifying unit, corrosion-resistant steel shell, and entrance tube. Bulletin includes engineering data, specifications, and dimensional drawings.
Tex-Vit Supply Co., Mfg. Division.

640—Sewage Lift Stations

Bulletin DJ-60 describes the *Delta-Ject* packaged pneumatic sewage lift station manufactured by Tex-Vit Supply Company, Manufacturing Division. A duplex unit available in 29 to 200 gpm, it features exclusive shell-within-shell design. Bulletin provides engineering data, specifications, and dimensional drawings.
Tex-Vit Supply Co., Mfg. Division.

637—High Capacity Aerator

Bulletin 7316 describes the D-O Aerator for application in both municipal sewage and industrial waste treatment plants. Can be adapted to a variety of tank sizes and is readily incorporated into existing tanks. Cutaways show aerators installed in round tank as well as in rectangular tank. Diagrams show flow.
Dorr-Oliver, Inc.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

638—Municipal Incinerators

Bulletin 1511 describes Dravo's incineration equipment based on the continuous flow principle. This equipment has a capacity of 12½ tons an hour, 300 tons a day. Illustrations show components and principle of operation. Line drawing shows layout of typical installation indicating flow of refuse.
Dravo Corp.

641—Small Plant Sewage Treatment

Bulletin 6692 describes Dorr-Oliver equipment for small plant sewage treatment which brings big plant results within the reach of the small community. Bulletin details the plant system; lists its many advantages; gives complete specifications. Photographs show installations and diagrams show equipment.
Dorr-Oliver, Inc.

639—Sewage Pumping Station

Complete engineering data manual on factory-bilt sewage pumping stations plus complete lineup of pneumatic ejector lift stations. Features design, operation, specifications, and selection data. Includes colorful bulletins on pump station, S&L sewage pump, and ejector stations. Cutaway shows components.
Smith & Loveless.

642—Comminutor Selection Handbook

Bulletin 2129-B1 is a selection and application handbook of comminutors for sewage and industrial waste treatment. Shows sectional elevations. Gives factors to consider for comminutor selection in the modern sewage or industrial plant. Line drawings show how comminutor works. Typical channel designs shown.
Worthington Corp.

WASTE DISPOSAL EQUIPMENT *continued*

643—Sewage Treatment Plant

This data manual on the S&L "Oxigest" sewage treatment plant contains notes on design, engineering data, specifications, and installation instructions plus lists of accessory equipment. Now 27 standard sizes; factory-built units for small subdivisions, schools, motels, factories in need of dependable sewage treamtent.
Smith & Loveless, Inc.

644—Hardinge Facilities

Bulletin 101 describes the various tools and fabrication facilities of the Hardinge Manufacturing Company. Covers pattern shop, foundry, machine shop, plate steel work, and custom machinery shop. Completely describes Ni-Hard and Meehanite metal, which is cast in their foundry. Profusely illustrated.
Hardinge Co., Inc.

To order copies of the bulletins, please fill out the card between pages 16 and 17 or 48 and 49.

645—Sewage and Waste Treatment

Bulletin 35-D describes the Hardinge line of equipment for water, sewage, and industrial waste treatment. Described are circular clarifiers, rectangular clarifiers, automatic backwash sand filters, hydroclassifiers, flocculating units, and digesters. Illustrated with line drawings and photographs.
Hardinge Co., Inc.

WATER TREATMENT EQUIPMENT

646—Coagulants and Coagulation Aids

Chemistry of coagulation applied to effective water treatment in municipal and industrial plants, practical approaches to problems, and solutions are discussed in Bulletin A-1. Application of sodium aluminates; refined montmorillonites; cationic, anionic, and non-ionic polymers; new concept of "Inline Clarification."
Nalco Chemical Co.

649—Filter Plants

Filter plants for the removal of iron, manganese, taste, odor, and gas are described in a new General Filter bulletin. Various problems are listed and answers given. Four basic treatment methods are described and graphically shown in drawings. Actual installations in all parts of the country are shown.
General Filter Co.

647—Industrial Water Conditioners

Application of *Bru-Cex* industrial feeders is discussed in Bulletin 2-177. *Bru-Cex* is a phosphate type water conditioner used to prevent red water in private well supplies and to control lime scale and corrosion in hot water systems, pipe lines, air conditioning and cooling systems. Shows typical installations.
Bruner Corp.

650—Commercial Water Softeners

Bulletin 2-368 covers the specification and installation of package-type zeolite water softeners for commercial applications. Both manual and automatic models are listed with softening capacities ranging from 150,000 thru 900,000 grains. Twin models range up to 1,800,000 grains with flow rates up to 200 gpm.
Bruner Corp.

648—Ion Exchange

Technical bulletin explains principles and chemical reactions of ion exchange in simple, understandable terms. Describes and shows flow-diagrams of eight typical multi-column deionizers. Gives details about mixed-bed type Ultra-De-Ionizer giving water of highest chemical purity. Deionizer selection chart.
Elgin Softener Corporation.

651—Cartridge De-Ionizers

Operating on the same principle as large mixed-bed de-ionizers used in power plants and for process water supplies, these cartridge de-ionizers are designed to furnish small quantities of purified water for laboratories and pilot plant applications. Cartridges and installations illustrated. Prices are included.
Illinois Water Treatment Co.

WATER TREATMENT EQUIPMENT *continued*

652—Zeolite Water Softeners

Technical bulletin on zeolite water softeners of conventional and "double-type in manual and automatic models. Explains how "double-check" type gives up to 44% greater soft water output. All types of ion exchange zeolites covered. Water softener selection chart is included. Bulletin is illustrated.

Elgin Softener Corp.

653—Automatic Gravity-Filter

Bulletin 4351B describes the Permutit automatic valveless gravity filter. Operates automatically without a single valve, agitator, pump, flow controller, or even an attendant operator. Applications, operation, flow and wash rates, installation. Schematics show operation of industrial and municipal filters.

Pfaudler Permutit Co.

654—Heat Rcovery Evaporator

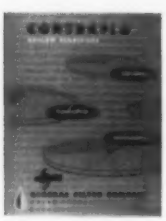
Bulletin V-100 describes the *Aquavap* line of heat recovery type evaporators. Water produced is fresh and clean regardless whether it is salt or brackish originally. Applications, advantages, installation procedures, and operation outlined. Selection guide in tabular form.

Maxim Evaporator Division
American Machine & Foundry Co.

655—Chlorine Activated Silico

Cat. 60.110 describes redesigned activated silica equipment. WT Silactor uses V-notch Chlorinator offering wide range adjustment. Can also be used with liquid activants instead of chlorine. Vacuum operation ensures safety, prevents chlorine leakage. Catalog shows operation, gives technical data, dimensions.

Wallace & Tiernan Inc.



656—Upflow Clarifiers

In bulletin 5811 models C, CP, CPS, P and CF of General Filter Company's upflow clarifiers are described and illustrated. Flow charts and important features, essential to economical and efficient operation, are included. Typical contraflo industrial, utility, and municipal installations are shown and described.

General Filter Co.

657—Treatment Tanks

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering & Mfg. Co.

658—High-Flow-Rate Clarifiers

Bulletin CL-158 describes the *Illco-Way* continuous high-flow-rate clarifier, an upflow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment.

Illinois Water Treatment Co.

659—Packaged Demineralizers

Bulletin 4721 describes Permutit packaged demineralizers, factory-assembled systems ready to connect and operate. Contains detailed information on mixed-bed, two-step, and non-regenerable demineralizers. Special skid mounted units, completely packaged and shipped as finished units. Models illustrated.

Pfaudler Permutit Co.

660—Elevated Water Tanks

This new folder, printed in full color, describes design features and advantages of a wholly new form of elevated water tank, the Graver *"Aquatore"*. The tank, designed as a torus tank on a flared column, provides large-capacity storage, 300,000 to 3,000,000 gallons. Diagrams also show conventional tanks.

Graver Tank & Mfg. Co.

661—Water Control Equipment

Bulletin 315 illustrates, and provides, specifications for, the complete line of Sparling propeller-type main-line meters, recording instruments, and control equipment. Various applications, flow ranges, sizes, cut-away drawings, and installation information are all included. Pictured are production and test equipment.

Hersey-Sparling Meter Co.

662—Sodium Zeolite Water Softeners

Bulletin 4520-E describes Cochrane water softeners with the hydromatic single control valve. Complete explanation includes flow rates, operating cycle, softening capacity, steps of operation, and details of construction. Cutaway show components and typical arrangement. Photographs of typical installations.

Cochrane Corp.

663—Water Softeners

Industrial sodium zeolite water softeners are discussed and illustrated in booklet 28B7107. Construction and operation of manual and automatic, single and multiple units are discussed and illustrated with cutaway views. A handy selection table provides information on capacity and specifications. Installation pictured.

Allis-Chalmers.

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